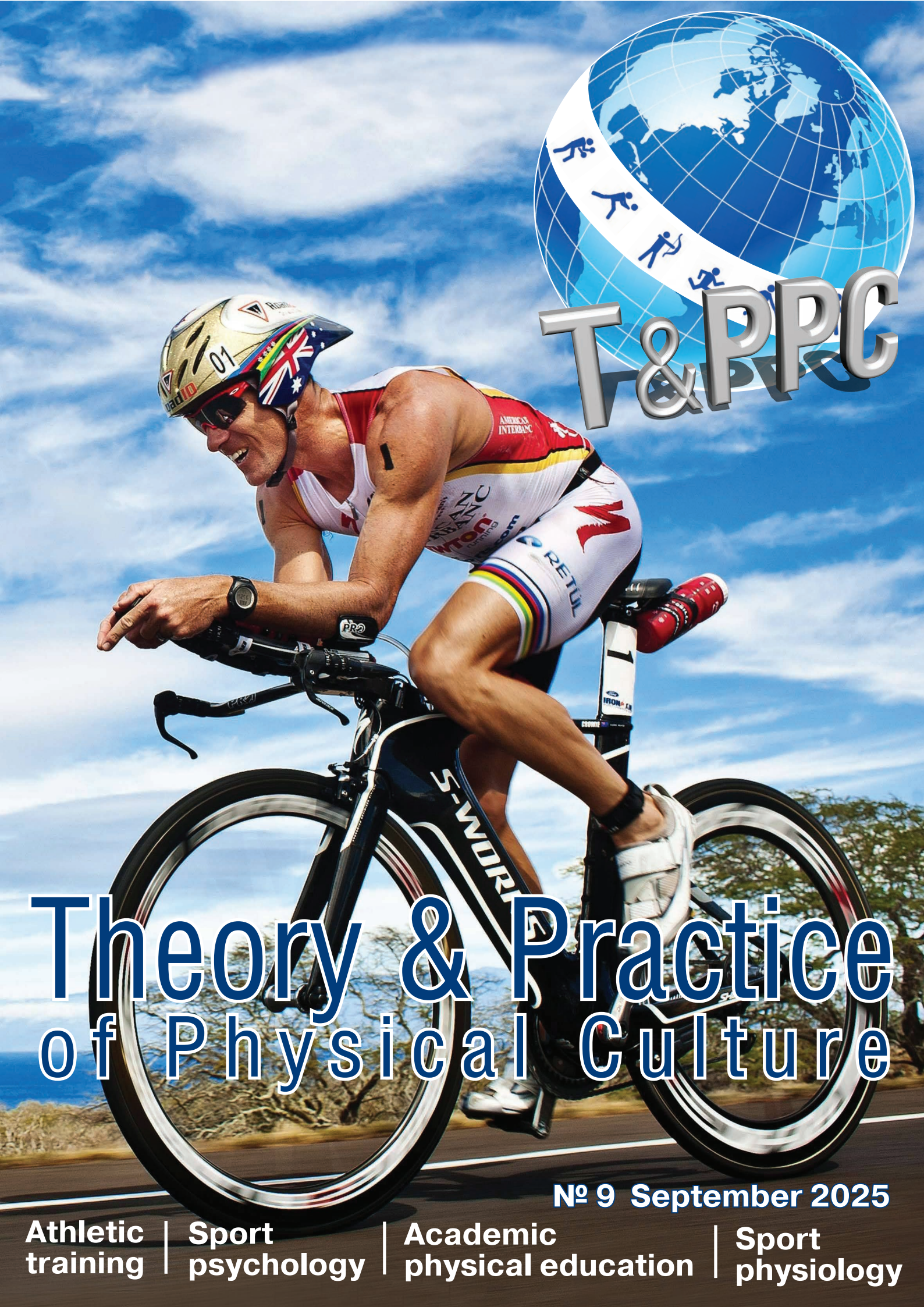

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Theory and Practice of Physical Culture

Contents

Approaches to the study of progress, monitoring of sports training and selection of athletes in a sports context

UDC 796.011.3

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Abstract

Objective of the study is to systematise the research of domestic specialists on the development, control of physical abilities and their assessment in the selection process.

Methods and structure of the study. An analysis of literature and online sources was conducted, along with a logical comparison of the available material and reports from scientific and practical conferences by leading scientists in the field of sports training and morphofunctional diagnostics.

Results and conclusions. This article attempts to propose a research framework for studying the effectiveness of various aspects of athlete preparedness. It outlines the main aspects of a basic system of interdisciplinary research in the field of sport, carried out by Russian scientists with highly effective end results.

Keywords: *methodology, development and control, sports training, sports selection, monitoring.*

Introduction. The main focus on the development of athletes' physical abilities and their monitoring is based on the results of research conducted by Russian scientists for further analysis by specialists in the fields of sports training, physiology, morphology, and genetics.

The study of various conditions of athletes, based on interdisciplinary research, has made it possible to identify a structure for assessing the development and monitoring of athletes' physical abilities throughout their participation in their chosen sport.

Objective of the study is to systematise the research of domestic specialists on the development, control of physical abilities and their assessment in the selection process.

Methods and structure of the study. The research methods included analysis of literature and online sources, logical comparison of available material, as well as reports at scientific and practical conferences by leading scientists in the field of sports training and morphofunctional diagnostics.

Results of the study and discussion. This paper attempts to identify the most effective approaches to conducting and organising research, processing the data obtained, and interpreting it by domestic specialists, whose work has been and remains at the forefront of modern sports science (Fig. 1).

In the process of effective sports training, it is necessary to take into account a number of aspects of the athlete research system listed below.

The first aspect is physique. Analysis of the physique characteristics of both young and qualified athletes in 'polar' sports specialisations, which place different demands on the athletes' bodies [2-9, 11], showed that even at the level of average statistics, there is a clear correlation between body structure and specific motor abilities. This relationship could be examined using data analysis for representatives of virtually all species, and an answer could be given as to what the physique of a modern healthy person should be like in order to withstand the ever-increasing socio-psychological stresses without breaking down. A single generalised model of physique has not yet been created [8, 11]. The physique model of athletes can only be a rough guide, rather than a model of the mod-

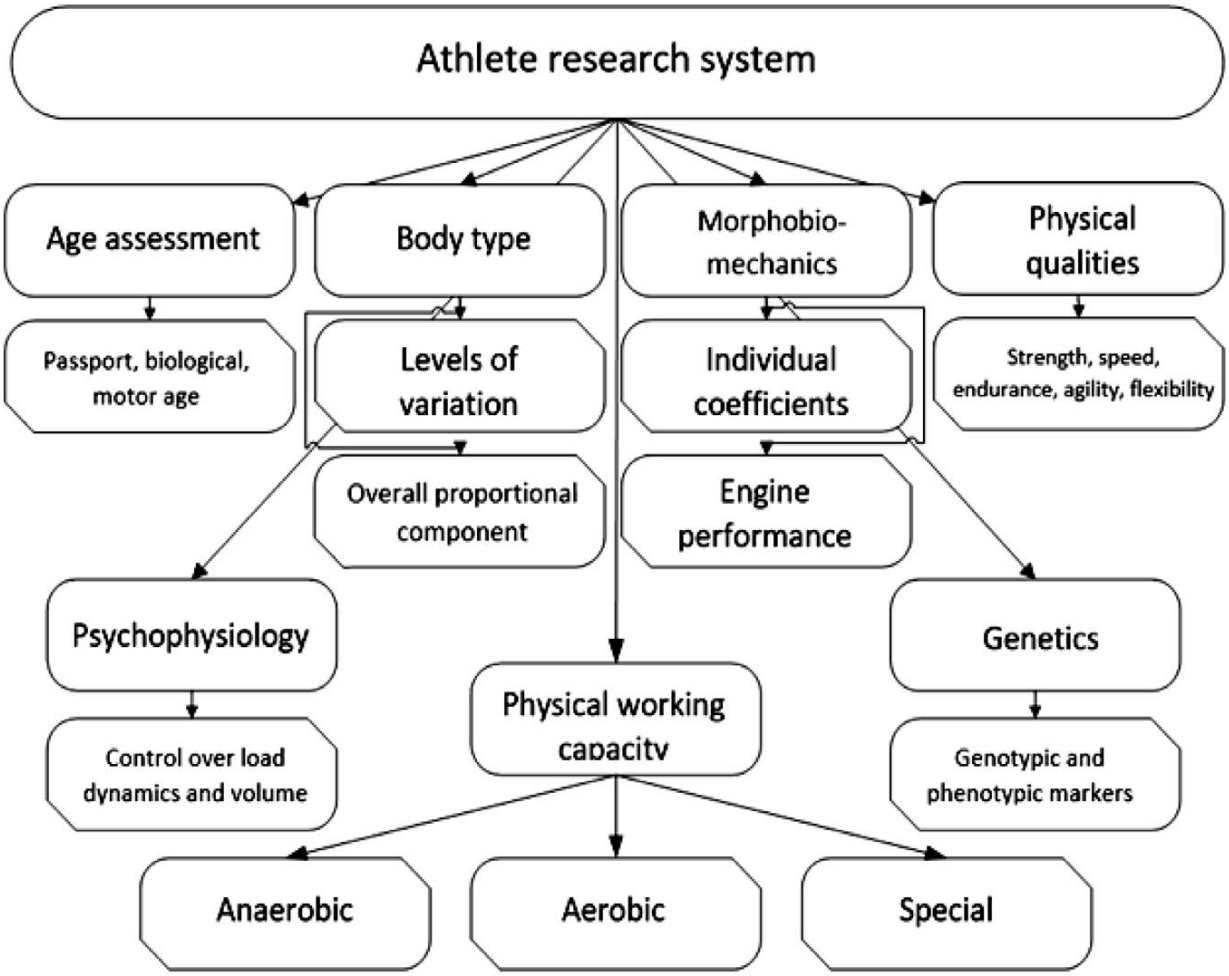

Fig. 1. Theoretical and methodological foundations of the athlete research system.

ern human being, since the latter must necessarily take into account a specific environmental factor – professional activity.

The second aspect is morphobiomechanical. A specialist whose field of activity is the human body must first and foremost understand that the human organism is a relatively open, self-regulating system, confirmed by diverse and numerous influences and morphofunctional changes throughout the course of life [4, 5, 8, 9].

For each sport, it is necessary to develop biomechanical measurement techniques that allow for high-precision monitoring of the development of motor actions and prevent injuries to the individual flexor and extensor muscles that bring the hip and lower leg into and out of position and are involved in basic sports movements. Information is needed on changes in both the total muscle mass and individual parts of the athlete's body [4, 5, 8].

Can body length and mass be used as initial values to obtain information about changes in young athletes under the influence of sports training? It turns out that this is possible and highly informative. Here are some ways to process these indicators.

Quetelet's weight-height index (BMI = weight (kg) / (height (m))). This index ranges from 0.300 to 0.650 and is usually associated with a particular sport.

Body mass index (Roher) = weight (kg) / (height (m)) . This index ranges from 2.000 to 3.200 and allows an indirect assessment of an athlete's preparedness and predisposition to a particular sport.

There are about 12 more indices that are correlated with each other and can be used, but they do not provide any new information. The Quetelet and Rorer indices are quite simple and can be recommended for use by coaches as indicators of changes under the influence of training. The indices can be measured and calculated two to four times a year, considering their

dynamics as a delayed adaptation to changing training loads [8].

It is believed that human development is determined by three main programmes: species (genetic), social and ontogenetic. The ontogenetic programme is formed as a result of the interaction between the genetic and social programmes. The social programme plays a leading role in the improvement of human motor activity, as confirmed by physical culture and sport, the continuous growth of the arsenal and biomechanical complexity of physical exercises.

The third aspect is age. The following terms can be found in the literature: 'calendar age' (also known as passport age or chronological age), 'biological age' and 'motor age' [2, 5, 6, 11].

Passport age is the time from the moment of birth, determined by the number of years, months and days lived.

Biological age indicates the degree of maturity (physical, intellectual) achieved by the organism.

The concept of 'biological age' arose due to the fact that children and adolescents of the same passport age often differ in their level of biological maturity by 4-5 years, as a result of which they usually have harmonious acceleration and greater morphofunctional capabilities than their peers.

The biological problem has long since become a social one due to the heterochrony of development in modern children in the adolescent population. Differences in age, gender, physique, and level of biological maturation subsequently determine the heterochrony of their physical development.

Often, physical and mental maturation, the functional capacity of the musculoskeletal system and internal organs, and the general condition of the body, i.e., everything that characterises the so-called biological age, does not correspond to the calendar age, either preceding it or, conversely, lagging significantly behind. This discrepancy can be further exacerbated by acceleration, which is understood as a complex set of phenomena characterised by the following main features: accelerated physical development, earlier puberty, and increased body size compared to peers [4, 8].

The relationship between the passport and biological age of children and adolescents is one of the pressing issues attracting the attention of representatives of many scientific and practical disciplines (sports medicine, age physiology, pedagogy, theory and methods of physical education, etc.). This is because biological age, to a greater extent than chronological age, reflects ontogenetic maturity and the individual nature of adaptive responses to physical exertion.

Motor age is determined by the level of a child's motor development, assessed on the basis of standardised motor tests, taking into account their biological age, somatic type and chronological age.

The fourth aspect is the characteristics of physical training and physical qualities. The most significant changes in the development of children's physical qualities occur in preschool and early school age. This is convincingly demonstrated, in particular, by research conducted by us in the laboratories of the Federal Science Center of Physical Culture and Sport (VNIIFK), Research Institute of Physiology of Children and Adolescents (Age Physiology) of the Russian Academy of Education, and Smolensk State University of Sport over more than 50 years. These changes are due to the disharmonious development of body mass components and the disproportionate growth processes of the bones of the limbs. Scientists have proven that the development of motor skills in children does not follow a smooth upward curve. From 5 to 10 years of age, according to the unanimous opinion of the authors, it is necessary to 'lay the foundation' for physical (coordination and conditioning) excellence and to master basic motor skills and abilities. When training children, adolescents and young people, it is necessary to take into account the most favourable (sensitive) periods in the development of various physical qualities (abilities): strength, speed, speed-strength, endurance, flexibility, coordination abilities, taking into account the individual characteristics of each individual [1, 2, 8-10, 16, 17].

Critical periods are characterised by increased activity of individual genes and their complexes that control the development of specific qualities of the organism. During these periods, the following occur: a significant restructuring of regulatory processes; a qualitative and quantitative leap in the development of individual organs and functional systems, resulting in the ability to adapt to a new level of existence of the organism and its interaction with the environment. Such a restructuring increases the number of degrees of freedom of the organism and opens up new horizons of human behaviour, that is, in essence, it is a 'preemptive reflection of reality' (P.K. Anokhin).

Sensitive periods are periods of reduced genetic control and increased sensitivity of the organism to environmental influences, including pedagogical and training influences [5, 6, 16]. Moreover, sensitive pe-

riods in children of different body types differ, and this must be taken into account in the process of their sports training [11].

Critical and sensitive periods only partially coincide. While critical periods create the morphofunctional basis for the organism's existence in new living conditions (e.g., adolescence in teenagers), sensitive periods realise these possibilities, ensuring the adequate functioning of the body's systems in accordance with the new requirements of the environment.

The fifth aspect is the assessment of psychophysiological status. Extreme physical exertion in sports limits motor activity due to the development of bronchial obstruction, cellular infiltration of the bronchial mucosa, and remodelling of the respiratory tract. There is an increase in the capacity of the vascular capillary bed, an increase in blood viscosity, and an elongation of mucociliary clearance time; at the same time, an increase in blood filling of the lungs at maximum loads in trained athletes leads to compression of the pulmonary circulation and the development of acute respiratory distress syndrome. This serves as the basis for remodelling of the respiratory tract: hypertrophy of the respiratory muscles occurs, subendothelial fibrosis develops, a decrease in the elasticity of the bronchial wall is noted, alveolar ruptures and pulmonary capillary occlusion under conditions of mechanical and oxidative stress, and increased tone of the sympathetic division of the ANS, leading to vasoconstriction and reduction of the vascular bed [5].

The sixth aspect is sports genetics. Timely identification of factors limiting physical activity, the ability to determine these factors, and the appropriate use of corrective measures help to achieve high results in sports and maintain the health of athletes. For example, studying the distribution of polymorphisms of the 5HTT and 5HT2A genes in representatives of team sports allows for the selection of individuals predisposed to greater psychological stability and success at the early specialisation stage. The assessment of athletes' visual-motor reactions allows for the comparison of genetic and phenotypic markers for predicting successful athletic performance [5].

Intensive sports training that is not in line with genetic predisposition will lead to limited physical performance and reduced competitive results. Currently, it is considered increasingly appropriate to use the results of genetic research in the process of sports selection, choosing a sports specialisation, and identifying a person's predisposition not only to perform various types of exercise, but also the body's ability to maintain homeostasis, avoid maladjustment, and develop pathological conditions.

The seventh aspect is physical working capacity.

Physical working capacity is an integral indicator of the functional state of the body, one of the objective criteria for human health, and an important indicator of the effectiveness of sports training [12]. As one of the components of an athlete's overall fitness, working capacity has become the subject of close attention by many domestic researchers at different stages and periods of sports training. In the process of testing the physical working capacity of highly qualified athletes, laboratory research methods such as gasometry, bicycle ergometry, and ergometry are widely used to determine indicators characterising aerobic working capacity. The MAM test and the Wingate test are often used to determine anaerobic performance [15]. Along with the generally accepted methods for determining aerobic and anaerobic performance, methods for determining special performance are also used, involving the use of special exercises specific to a particular sport and the recording of heart rate indicators [13, 14].

C**onclusions.** The aspects of the athlete research system presented in this work, as well as the scientific materials presented in the literature by domestic specialists, on various issues of diagnostics, training, and the use of modern medical and biological knowledge in the field of managing and correcting the training process of athletes, will help coaches to better understand and improve the process of athletic selection and the system of athletic training, which will ultimately contribute to high results in sports.

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Correlation between age, nationality and results of elite ski racers between 1982 and 2025

UDC 796.922

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Abstract

Objective of the study is to investigate the relationship between the age and nationality of athletes and their performance at various distances in World Cups, World Championships and Olympic Games between 1982 and 2025 in order to identify current trends in the development of the sport.

Methods and structure of the study. Data for the period 1982-2025 was downloaded from the International Ski Federation website and the 'Statistics' section for analysis.

Results and conclusions. Trends have been identified indicating an increase in the average age of prize-winners among men from 1982 to 1999 and among women from 1982 to 1996, which reaches 29-30 years. There is also a forecast for a decrease in this indicator to 26-27 years by 2020, followed by an increase by 2025. The most noticeable changes are observed in middle-distance races for men and long-distance races for women. Until 2022, Russian athletes demonstrated the best results in pursuit races. The obtained research data can be used to improve the training system of ski racers in our country.

Keywords: *ski racing, international competitions, correlation, statistical analysis, nationality, age trends.*

Introduction. Skiing continues to evolve. After sprinting was included in the international competition program in 1996, contact disciplines such as mass starts, pursuit races and skiathlon appeared and continue to change. In recent years, there have been significant changes to the program. In particular, the International Ski Federation has equalized the length of the distances for men and women in the World Cup and World Championships. Next season, in honor of the 20th anniversary of the Tour de Ski, a new race format will be used in the third stage in Toblach (Italy), in which the 20-25 best skiers will compete in separate races over a distance of 5 km. Based on the results of the first race, the next race will be held in a pursuit format [1]. Changes in the sport, the emergence of contact disciplines, and increased speed have led not only to changes in performance factors, but also to a decrease in the peak age of maximum achievements in a long-term retrospective [4]. Studies conducted in 2021 showed that the average peak age was 26.2 years in distance races and 26.0 in sprints. In addition, Norwegian researchers have found a trend towards a decrease in the peak age of athletes born in later years, which could be related to earlier specialization, changes in training or selection criteria.

Other studies have shown that the age of peak performance is positively related to the length of distance in endurance sports [2]. At the same time, there is a lack of research in the field of cross-country skiing that uses data analysis to identify current trends in the sport, areas for development and improvements to the training system.

Objective of the study is to investigate the relationship between the age and nationality of athletes and their performance at various distances in World Cups, World Championships and Olympic Games between 1982 and 2025 in order to identify current trends in the development of the sport.

Methods and structure of the study. The data for analysis was downloaded from the International

Ski and Snowboard Federation website [1], then using the RStudio development environment and the Rvest library, data for the available years – from 1982 to 2025 – was downloaded. The correlationfunnel library [3] was used to binarise the variables, which made it possible to analyze both numerical (age) and categorical (nationality) variables. Next, to identify and visualize trends, the correlation coefficient was calculated for the variable reflecting the top three finishers (1 or 0) and the variables reflecting the nationality and age of the skier at the time of the competition. Pearson's correlation coefficient was used, and only correlations significant at the 0.05 level are presented in the article.

Results of the study and discussion. The performance of athletes of different nationalities in FIS international competitions between 1982 and 2025 in races of various lengths and formats was analyzed. In accordance with the data in the protocols, sprints, middle distances (5-20 km for men, 5-15 km for women), long distances (30-50 km for men and 20-50 km for women) and a separate category of pursuit races were identified.

It was found that in long-distance races for men in different years, athletes from the USA, Canada, Russia, Switzerland, Germany and Norway dominated (Fig. 1). In women's races, significantly fewer statistically significant correlations were found during the study period, and only Norwegian athletes had a decisive advantage in long distances in different years.

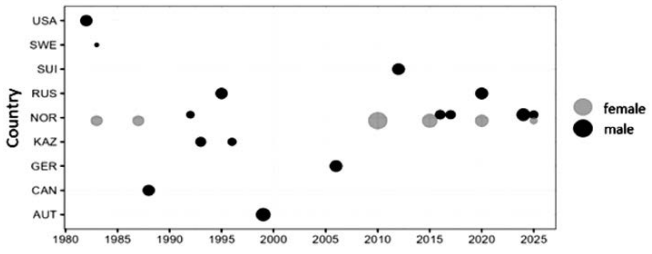

Fig. 1. Correlation between the number of prize places in long-distance events and nationality among men and women

In middle-distance races (Fig. 2), on the contrary, more significant correlations were found among women, showing periods of clear superiority of national teams in different periods. In some cases, this dominance was achieved through the performance of a single athlete, while in others it demonstrated the superiority of the entire team.

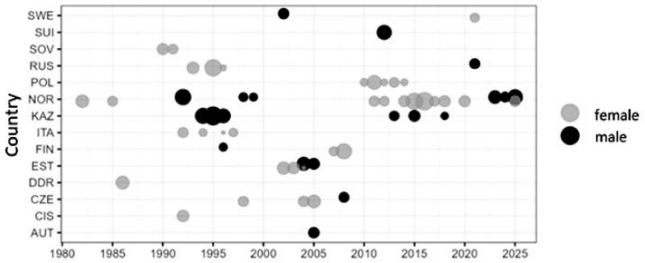

Fig. 2. Correlation between the number of prize places in middle-distance events and nationality among men and women

It should be noted that, despite the successful performances of Alexander Bolshunov and other Russian skiers over the past decade, the Russian men's team only dominated the middle distances in 2021. In sprint races, representatives from a smaller number of countries had a clear advantage during the competitive seasons for both men and women (Fig. 3).

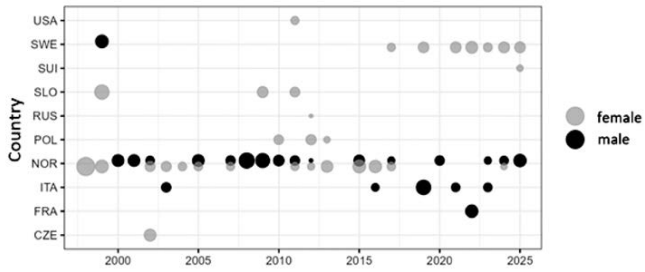

Fig. 3. Correlation between the number of prize places in sprinting and nationality among men and women

Over the years, only the Swedes, Italians and French have been able to pose serious competition to the Norwegians. In the women's group, there is a clear period of Norwegian dominance, which ends in 2017 when Swedish skiers take the lead.

Thus, the analysis revealed periods of dominance by representatives of different countries in ski races of various formats and lengths. The predictable advantage of Norwegian athletes is most pronounced in the men's sprint and women's long-distance races. Russian athletes competed most successfully in pursuit races. After the Russian team was suspended, the Norwegians' advantage increased in all types of races, indicating a real decline in competition on the world stage, despite the fact that the chances of small teams getting into the lead increased.

To assess age trends in cross-country skiing, the average age of medalists in each type of competition from 1982 to 2025 was determined (Fig. 4). Fig. 4 shows that the average age of medalists in men's distance races increased from 25 in 1985 to 30 in 1999, stabilized at approximately this level, and then showed a slight downward trend until 2021. When sprinting first appeared, both young and older athletes became winners in this discipline, but until 2018, sprinters were, as a rule, younger on average than distance runners.

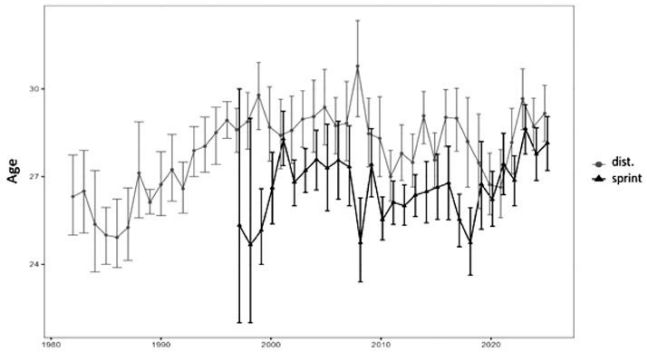

Fig. 4. Average age of male winners of international cross-country skiing competitions (confidence intervals) in distance races (5, 10, 15, 30, 50 km) and in sprints

In women's competitions, there was also an increase in the average age of winners before the advent of sprint races, and some stabilisation of this indicator in long-distance races until 2006. Interestingly, in recent years, there has been another increase in the average age of competition leaders for both men and women in short and long distances. This is probably due to the ageing of individual athletes, and at some point, as a result of generational change, there will be another decline in age indicators, but it should be noted that there is no 'rejuvenation' of the sport.

Conclusions. Analysis of data from international cross-country skiing competitions over the past 43 years has revealed trends in the age of medalists and visualized the relationship between nationality and age with medal positions in races of various formats and lengths.

It was determined that Russian athletes performed best in pursuit races, while Norwegians have had an overwhelming advantage in men's sprints and women's long-distance races for many years. In recent years, competition in cross-country skiing has declined, and the advantage of Norwegian skiers is undeniable in all disciplines.

There is also a trend towards an increase in the average age of male winners (between 1982 and 1999) and female winners (between 1982 and 1996) to 29-30 years, a slight decrease in this indicator by 2020, and a subsequent increase by 2025.

The results of the study can be used to improve the training system for cross-country skiers in our country. The lack of 'rejuvenation' in the sport, including in sprint disciplines, should encourage a focus on long-term planning, retaining talented athletes, and counteracting the forcing of sports training at an early age.

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Implementation of additional educational programs for schoolchildren in swimming training

UDC 371.134

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Abstract

Objective of the study is to experimentally substantiate the optimal set of special sports swimming exercises for teaching schoolchildren to swim as part of an additional general education program.

Methods and structure of the study. The following research methods were used to solve the problems such as: theoretical analysis and summarization of literary sources, interviews, pedagogical observation, and pedagogical experiments.

Results and conclusions. Effective exercises and their sequence of application in swimming instruction have been identified. The proposed set of exercises allows improving physical fitness and strengthening the health of schoolchildren studying under an additional general education program. During classes, the time required to master basic swimming skills is significantly reduced, and correct swimming technique is established, which allows students to move on to more complex skills in a short period of time.

Keywords: *general development programs, general education programs, sports swimming, efficiency.*

Introduction. Additional education is a type of education that is aimed at comprehensively meeting the educational needs of a person in intellectual, spiritual, moral, physical and (or) professional development and is not accompanied by an increase in the level of education [3]. One of the types of additional education in accordance with Federal Law No. 273-FZ dated December 29, 2012 "On Education in the Russian Federation" is additional general education general development programs, which are implemented, among other things, for children.

The additional general education general development program of physical culture and sports orientation in swimming is aimed at improving the swimming skills of students, increasing athletic performance. The goals of the program are also: introducing students to regular physical education and sports, comprehensive physical development of students, formation of the need for systematic physical education and sports, health promotion, initiation into a healthy lifestyle, education of discipline, socialization of personality, development of strong-willed qualities, determination to achieve goals [1]. The program includes: general physical training, special physical training, technical training, tactical training. In the course of classes, work is underway on the moral and volitional training of students. The program focuses on the use of a wide range of exercises that contribute to the formation of a physically active personality. At the same time, there is a need to modernize additional programs, including through the development of new techniques aimed at maximizing the realization of students' motor skills. The developed methods should lead to positive dynamics in the development of physical, moral and volitional qualities of the personality of students, the development of a stable interest and conscious attitude to swimming, and the improvement of athletic performance [2].

The relevance of this work is justified by the need to develop an effective set of special exercises for sports

swimming in order to improve athletic performance among schoolchildren engaged in an additional general educational program.

Objective of the study is to experimentally substantiate the optimal set of special sports swimming exercises for teaching schoolchildren to swim as part of an additional general education program.

Object of research: a set of special sports swimming exercises.

The subject of the research is the process of teaching swimming to schoolchildren according to the program of additional general development education using modern sports swimming exercises.

The objectives of the study are to identify the most effective special swimming exercises that allow improving the level of physical fitness of schoolchildren studying in the additional general education general development program of physical culture and sports orientation in swimming; to conduct an experiment and evaluate its practical significance for solving the goals of the additional general development program in swimming.

Methods and structure of the study. The organization of research work was carried out in three stages. When choosing research methods, it was crucial that they provided sufficient infor-

Table 1.Summary results based on the results of three conducted cross-sections by groups

I Well-floating							
n/a	**Surname and initials**	**Entrance control crawl**	**1st cut 100 m crawl**	**2nd cut 100m crawl**	**Entrance control breaststroke**	**1st cut 100m breast stroke**	**2 nd cut 100 m breast stroke**
1	Belous A.A.	1.55	1.55	1.54	2.26	2.26	2.26
2	Golikov Yu.K.	2.00	1.59	2.00	2.30	2.30	2.28
3	Kakotkin M.V.	2.20	2.18	2.16	2.29	2.29	2.29
4	Lyashenko D.A.	1.58	1.58	1.57	2.19	2.19	2.20
5	Menshikov D.O.	2.06	2.06	2.06	2.25	2.25	2.25
6	Negreev N.M.	2.03	2.03	2.03	2.20	2.20	2.18
7	Solopov L.R.	2.02	2.02	2.01	2.30	2.30	2.28
8	Troyan A.A.	2.05	2.05	2.05	2.25	2.29	2.25
9	Udalov S.R.	2.02	2.03	2.04	2.28	2.28	2.28
10	Shilchikov A.D.	1.59	2.00	2.01	2.24	2.24	2.24
The total time of the group		20.30	20.29	20.27	24.16	24.20	24.11
Average group time		2.03,0	2.03,0	2.02,7	2.25,6	2.26,0	2.25,1
II Weakly floating							
1	Grebenkov A.E.	3.00	2.50	2.38	3.40	3.05	2.59
2	Zhuravlev V.A.	2.48	2.40	2.32	3.05	2.51	2.48
3	Katko N.A.	3.33	3.20	3.08	3.30	3.13	3.01
4	Kostyukovich S.V.	3.00	2.52	2.43	3.40	3.30	3.18
5	Lavrinenko D.S.	2.33	2.30	2.25	3.10	2.56	2.50
6	Miroshnichenko A.V.	2.45	2.29	2.22	3.20	3.11	2.59
7	Parshutkin V.A.	2.40	2.38	2.28	3.17	2.51	2.49
8	Pashkov A.A.	3.01	2.34	2.26	3.08	2.57	2.52
9	Pidpurny V.O.	3.50	2.54	2.46	3.35	3.26	3.14
10	Starostin N.Y.	3.00	2.42	2.33	3.14	3.06	2.58
The total time of the group		30.10	27,29	25.51	36.03	31.06	29.48
Average group time		3.01,0	2,44.9	2.35,1	3.36,3	3.06,6	2.58,8

mation about the effectiveness of the developed complex.

A survey in the form of a conversation. During the survey, information about the level of athletic fitness, swimming skills, as well as a number of demographic characteristics that should have been taken into account when organizing and conducting this study was previously clarified. During the study, 20 people participating in the experiment were interviewed.

Pedagogical supervision was applied throughout the work. The method of pedagogical observation was used to study the effectiveness of the proposed sports swimming exercises. The control tests were conducted in order to study changes in the level of development of physical qualities in schoolchildren enrolled in the additional education program, when the developed complex of sports swimming exercises was included in the training process. The pedagogical experiment consisted in the practical testing of the developed complex of special exercises for sports swimming.

Results of the study and discussion. 10th grade students were selected to conduct the experiment, as the standards for swimming 100 m freestyle and 100 m breaststroke begin to be passed from the 10th grade. According to Federal Law No. 329 of 04.12.2007 No. 329-FZ "On Physical Culture and Sports in the Russian Federation", and the amendments made to it on 25.06.2015, namely in Article 2, paragraph 2.1 on the All-Russian Sports Complex "Ready for Labor and Defense" (TRP), swimming standards are issued for passing the TRP standards.

A survey and conversation were conducted in the classroom, according to the results of which it is possible to draw an initial conclusion about the moral and psychological readiness of students for swimming. After conducting a conversation and survey, an entrance control was conducted in the classroom, which made it possible to accurately identify those who are able to perform swimming exercises rated "excellent" and "good", and those who have certain difficulties performing these exercises (Table 1).

At the second stage of the experimental study, the group was divided into two groups, in one of which swimming classes were conducted according to the schedule established by the work program, in the other the exercises described in the work were used in the classes. A 100m breaststroke and 100m breaststroke swimming test was conducted every 10 days.

The experimental study was conducted using special sports swimming exercises. During the experiment, the most effective exercises on land were identified, contributing to the development of physical qualities and the formation of swimming techniques, which is very important throughout swimming training, and especially at the initial stage. Special exercises on land: exercises with a rubber band; exercises with a partner; exercises with a stuffed ball (3kg ball); exercises with loops TRX; TRX push-ups; standing deadlift; upper deadlift; TRX squats; exercises on simulators. The most effective and accessible special exercises on the water and the sequence of their application were also identified for this category of subjects.

After the first 10 days of the experiment, the 1st section was performed. On the 20th day of the experiment, the 2nd slice was performed. The results of sections 1 and 2 are presented in Table 1.

As can be seen from Table 1, during the experiment, the time of the "Weak swimmers" group improved by an average of 25 seconds in the 100 m crawl and 15 seconds in the 100 m breaststroke. This is 8-14% of the average time of the group during the final cut, while the results of the "Good swimmers" group changed by no more than 0.2%.

Table 2 shows the dynamics of the results of the "Weakly floating" group from the beginning of the experiment to the moment of its completion. The results with a high degree of reliability ($p<0.05$) confirm the effectiveness of the proposed set of exercises for teaching swimming to schoolchildren according to an additional general educational program.

Table 2. Dynamics of indicators of subjects in the group of weakly floating

№	Indicators	A group of weakly floating						
		Before			After			p
		$\bar{x}_1$	±	m_1	$\bar{x}_2$	±	m_2	
1	100 m crawl	181,00	±	7,92	156,10	±	4,56	≤0,05
2	100 m breaststroke	201,90	±	4,45	178,80	±	3,41	≤0,01

During the statistical processing of the results obtained, we obtained positive dynamics of results in swimming at 100 m crawl t = 2.725, which corresponds to a significance level of $p < 0.05$, and in swimming at 100 m breaststroke t = 4.121, which corresponds to a significance level of $p<0.01$. The results obtained indicate significant shifts in the level of swimming fitness of students, with whom classes on the experimental complex were conducted.

Conclusions. The most effective exercises and the sequence of their application in teaching swimming have been identified. The proposed set of exercises makes it possible to improve physical fitness and strengthen the health of schoolchildren enrolled in an additional general educational program. When conducting classes using the proposed complex, the time required to master the initial swimming training skills is significantly reduced, as well as the formation of proper swimming techniques, which allows you to move on to the formation of more complex skills in a short time.

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Use of special exercises to intensify speed and strength loads in the training of student volleyball teams

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Abstract

Objective of the study is to improve the physical and technical training of volleyball players through the use of special speed and strength exercises.

Methods and structure of the study. The study tested 25 volleyball players from a student team aged 19.5±0.8 years. Interval training included multiple repetitions of game jump exercises lasting five minutes each at a competitive pace of ball play and relatively short rest periods between sets.

Results and conclusions. The use of the repeated interval method of conjugate development of special speed-strength qualities of various muscle groups forms the physiological basis for maintaining a high playing pace and amplitude of performing game techniques by volleyball players in the intense conditions of competitive struggle.

Keywords: *volleyball, sports results, student teams, speed and strength qualities, exercises, intensity.*

Introduction. High athletic performance in modern volleyball is determined by the application of integrated technical skills, which ensures continuity in the development of technical mastery. The most important skills in volleyball are serving and attacking, the successful execution of which can directly earn a team a point [4].

The physical basis for the implementation of technical skills in volleyball is speed and strength, which are among the most important elements of a volleyball player's physical fitness and make a significant contribution to achieving sporting results in terms of the implementation of sporting skills [3].

Achieving functional adaptation and maximum game endurance is due to the development and implementation of innovative training methods and techniques that are most relevant to the specifics of modern volleyball.

To simulate the real conditions of competitive play, researchers are striving to develop modern training methods based on intensive exercise at competitive speed [1]. This develops the ability to combine physical qualities and complex technical skills in players through the use of standardized exercises that develop speed and strength in accordance with the components of the training load [2, 5].

Objective of the study is to improve the physical and technical training of volleyball players through the use of special speed and strength exercises.

Methods and structure of the study. The study tested 25 volleyball players from a student volleyball team aged 19.5±0.8 years who performed special fitness tests before and after completing a 6-month training program. The 90-minute training sessions were conducted three times a week using a high-intensity repetitive interval training method.

Interval training included multiple repetitions of game-specific jumping exercises, each lasting five minutes, at a competitive pace of ball play and with relatively short rest periods between sets.

The intensity of the exercises at each stage of the training varied by changing the speed of the exercises from submaximal (80-90% MOC) and maximal (90-95% MOC) to competitive. The optimal intensity of threshold training was maintained by performing game exercises at a speed of 88% MOC and 92% HR_{max} for 20-30 minutes.

To optimize MOC, an interval training method with a ball and high intensity load was used. Interval training included multiple repetitions of game jumping exercises, each lasting five minutes, at a competitive pace of ball play and with relatively short rest periods between sets.

The tests to assess the athletes' physical fitness included throwing a 2 kg medicine ball from a standing position for distance; standing long jump; serving the ball for accuracy; and attacking for accuracy.

Statistical data was processed using the Statistica and SPSS statistical software packages.

Results of the study and discussion. The concentration of technical techniques performed on the basis of explosive power in volleyball combinations is extremely high. Techniques such as jumping for attack and powerful fast hits on the ball are integrated into a single technical action, which requires the serial manifestation of speed and strength qualities.

Preliminary and final measurements show that the results of volleyball players' tests for explosive strength in their arms and legs show positive dynamics. This is due to the use of intensive exercises for speed work with the ball, which led to the development of explosive strength in the muscles of the legs and arms while maintaining the technique of performing game actions. The need to apply more force to perform jumps, strikes and movements at different intensities and with different numbers of repetitions contributed to an increase in the players' oxygen consumption efficiency. Repeated interval training improved oxygen consumption efficiency through technical economy of movement and the participation of an optimal number of motor neurons in competitive exercises. The achieved level of speed and strength development ensured greater speed in performing game techniques without additional energy expenditure.

The change in the power and accuracy of the ball's flight was due to the repeated use of special exercises for serving accuracy at time intervals corresponding to the play of the ball in competitive combinations.

The combination of technical exercises and speed-strength development methods in a single training block increased the players' ability to perform technical actions accurately in short time intervals while maintaining a high tempo of play and amplitude of game techniques.

The players' progress in performing powerful attacking shots is associated with exercises to develop the skill of selectively directing the ball at high speed into planned areas in accordance with game objectives.

The development of the ability to strike the ball powerfully and accurately while jumping, overcoming the resistance of blocking players, based on the development of speed and strength qualities, significantly reduced the percentage of errors and increased the effectiveness of players' attacking shots.

Conclusions. Isolated speed-strength training of the shoulder girdle muscles improves the overall functional condition of athletes without affecting the development of explosive strength in the lower limb muscles. The use of the repeated interval method of combined development of specific speed-strength qualities of various muscle groups forms the physiological basis for maintaining a high playing tempo and amplitude of playing techniques in the intense conditions of competitive wrestling.

Table 1. Dynamics of physical fitness indicators for volleyball players

Indicator	Before	After	P-value	
Throwing a 2 kg medicine ball from a standing position for distance, m	6,1±0,48	8,3±0,29	3,03	< 0,05
Standing high jump, cm	46,1±0,57	61,4±0,28	6,00	< 0,05
Accuracy of ball delivery, points	6,1±0,33	9,3±0,19	5,16	< 0,05
Performing an attacking strike for accuracy, points	7,7±0,22	9,5±0,20	6,10	< 0,05

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Identification of kinematic predictors of starting speed in track and field sprinters

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Abstract

Objective of the study is to identify the kinematic indicators of running steps that determine the effective achievement of starting speed by sprinters.

Methods and structure of the study. The subjects, 23 student athletes (age 22.6±3.2 years; weight 77.6±7.4 kg; height 1.78±0.03 m) engaged in athletics, performed six 10-metre sprint tests, which were recorded on video for subsequent kinematic analysis. The correlation coefficient of the kinematic indicators of running steps and running speed during the initial segment of the sprint distance was calculated.

Results and conclusions. The expediency of differentiated work on increasing the length of sprinters' running steps in balance with indicators of step frequency, ground contact time, and non-support phase time, which also characterize the deepening of morphofunctional changes that determine the effectiveness of increasing starting speed, has been confirmed.

Keywords: *sprinting, acceleration, kinematic indicators, student athletes, correlation coefficient.*

Introduction. Starting acceleration from a stationary position is an integral component of competitive activity for sprinters. In terms of duration, starting accelerations performed in sports are usually relatively short, lasting two seconds or less, which corresponds to a distance of about 15 metres. In this regard, the ability to accelerate – to achieve the maximum running speed over a short distance in a unit of time – is a significant factor in achieving high competitive results in sprinting.

To a large extent, the effectiveness of starting acceleration is determined by the kinematic indicators of running technique: step length, step frequency, ground contact time, and non-support phase time. It is believed that in order to increase the effectiveness of start acceleration, there should be an improvement in one or more parameters that affect a sharp increase in running speed – step length or step frequency [3].

A number of studies have established a relationship between acceleration intensity and high step frequency [4]. However, in mountain runners, after special speed training, the increase in running speed during acceleration was mainly associated with an increase in step length [1]. It is important for general physical training specialists to understand which of these two factors is most closely related to high running speed at the beginning of a short acceleration.

When analysing the kinematic factors that determine an athlete's acceleration efficiency, the temporal characteristics of the sprinter's step must also be taken into account. In particular, reducing the contact time with the ground contributes to an increase in step frequency, which also determines effective acceleration [2]. However, despite the overall increase in running speed, special speed training does not lead to a change in the contact time with the support surface when athletes run short distances at high speed [5].

Since the time of the non-support phase is related to the length of the step, acceleration on the running track increases with a shorter non-support phase. But if a longer step length increases acceleration, it may also mean that athletes with high speed capabilities have a longer ground contact phase in their running technique. Thus, the influence of ground contact time and ground contact phase on athletes' acceleration capabilities requires further research.

Objective of the study is to identify the kinematic indicators of running steps that determine the effective achievement of starting speed by sprinters.

Methods and structure of the study. 23 student athletes (age 22.6±3.2 years; weight 77.6±7.4 kg; height 1.78±0.03 m) involved in athletics and with no health issues were recruited for the experiment.

The testing was conducted in an athletics hall. The subjects performed six 10-metre sprint tests, which were recorded on video for subsequent kinematic analysis. The 10-metre distance was chosen as the initial acceleration phase of the start, which is important for sprinters. The reliability of the data collection procedures used in the study has been established in previous studies [3]. A 10-minute standardized warm-up was conducted before the testing.

For the kinematic analysis of technique, each subject performed six 10-metre sprint segments. During the first three start accelerations, the athlete's passage of the first 5 meters was recorded; during the next three segments, the athlete's passage of the second 5 meters was recorded. The time was measured using a speed meter placed on a table 0.7 m high and located 1.5 m behind the test subject. The speed meter consisted of a nylon line attached to the test subject's shorts and the other end wound on a reel, which unwound as the athlete moved. An optical sensor sent electrical impulses to the processor for every 0.1 meters of linear displacement of the test subject, and the time was recorded using an attached Seiko stopwatch. When starting from a standing position, the test subjects used a versatile stance and started on their own when ready.

The distance covered was recorded by a Sony HVR-Z5E high-speed video camera. The camera was placed at a distance of 8.0 m from the test subject's running line. To film the 0-5 m interval, the camera was set at a mark 2.5 m from the starting line, and to film the 5-10 m interval, it was set at a mark 7.5 m from the starting line. The video camera was synchronized with Motion Trace software, which allows visualizing the trajectories of the biomechanical links of the athlete's body and obtaining graphs of movements, speeds, and accelerations broken down by rectangular coordinates.

Statistical calculations were performed using the Statistica 12.0 package.

Results of the study and discussion. The running technique used by sprinters during the initial run-up is characterized by differences in kinematic indicators at the beginning of the race (Table 1).

All significant correlations between step kinematics and running speed from the start ranged from moderate to high values.

Table 1. Kinematic indicators of sprinting technique at various distance intervals

Indicator	Distance interval, m		
	0-5	5-10	10-15
Step length, m	1,18± 0,32	1,63±0,41	1,44±0,57
Step frequency, n/s	3,93±0,32	3,87±0,31	3,83±0,38
Time of contact with the support, s	0,15±0,03	0,13±0,04	0,14±0,02
Time of the unsupported phase, s	0,09± 0,01	0,13 ± 0,04	0,12±0,02

Table 2. Correlation coefficients between kinematic indicators and running speed at different distances

Indicator	Interval, m		
	0-5	5-10	10-15
Step length	436	496	447
Step frequency	-169	-016	-085
Time of contact with the support	-338	-384	-398
Time of the unsupported phase	438	268	339

The average step length at all distance intervals – 0-5 m, 5-10 m and 10-15 m – is significantly related to running speed in the initial acceleration phase. A longer step is associated with the effective development of push-off force during the contact phase, which is a special physical quality of a sprinter.

Long steps usually result in a longer non-support phase, which has the most significant correlation with running speed in the initial 5-metre segment. This indicates that a longer groundless phase results in a higher starting speed and is a consequence of the longer steps shown by athletes with high speed capabilities.

The contact time with the ground on the 0-5 m and 0-10 m segments, as well as the step frequency on the 10-15 m segment, also contribute to running speed efficiency. To effectively generate propulsive force, the duration of the support phase must remain within the optimal range, as this determines step length and, consequently, overall running speed.

No correlation was found between step frequency and running speed on distances longer than 5 m.

Step frequency over 5-10 m is a predictive variable for speed in the starting run-up section.

Increasing step frequency is especially important when transitioning to high speeds, including after the first 5 m of a sprint. No significant correlation between step frequency and running speed was found in any of the distance segments. This could be due to the longer step length shown by the subjects at much higher speeds. Since faster sprinters tend to have longer step lengths during the initial acceleration, this could have reduced the significance of step frequency in the study.

Conclusions. The analysis of the relationship between kinematic indicators and starting speed in sprinting confirmed the advisability of differentiated work on speed characteristics, using exercises aimed at developing push-off power and increasing the length of sprinters' strides. Step frequency, ground contact time and non-support phase time indicators also characterize the deepening of morphofunctional changes that determine the effectiveness of increasing starting speed.

Mobilization stimuli in exercises for developing starting speed should ensure a balance between the length, frequency characteristics of the running stride and the time parameters of acceleration in sprinting.

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Determining the effectiveness of oar blades in rowing

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Abstract

Objective of the study is to identify the main theoretical principles and measurement methods and provide practical examples of how to correctly determine the efficiency of a rowing blade in academic rowing.

Methods and structure of the study. A telemetric system was used for measurement, which allows for accurate measurement of effort, oar angles and boat movement, and uses this data to reconstruct the trajectory of the oar in the water during the stroke.

Results and conclusions. On average, the hydro-lift force provides about 56% of the total force on the blade, and the drag force provides the remaining 44%. The total drift of the blade center along its curved trajectory is 1.7 m, and the total blade efficiency is 80.5%. The oar blade is a fairly efficient propulsion device compared to the 24% average physiological efficiency of a rower. Therefore, of all the metabolic energy consumed by the athlete, less than 6% is lost to blade drift, and most of it is dissipated as heat in the rower's body. The blade's efficiency was higher at the beginning and end of the stroke, so it is advantageous to quickly increase the effort after the catch and maintain it longer at the end, in other words, to make the effort curve more rectangular. This is also useful for both overall power and the effective dynamics of the rowing system.

Keywords: *academic rowing, mechanical efficiency, oar blade, measurements.*

Introduction. The propulsive efficiency or efficiency of the oar blade is a popular topic of discussion in the rowing community, and opinions remain quite controversial. The traditional view, as outlined in rowing textbooks [1, 2, 3] is that when the oar is at an acute angle at the beginning of the stroke, a force perpendicular to the boat's velocity vector arises, which 'compresses the oarlock inward rather than propelling the boat,' resulting in a loss of rowing power and making the oar less effective. This controversial position is easily refuted [4] if we return to the basics of mechanics, according to which power is the scalar product of the force and velocity vectors (their magnitudes multiplied by the cosine of the angle between them), so when these vectors are mutually perpendicular (cosine 90° = 0), the power is zero. Since the lateral force is perpendicular to the speed of the boat, it does not create energy losses and does not reduce the efficiency of the oar blade, but only changes the ratio of force and speed of the rower's work, i.e., makes the dynamic transmission of the oar heavier. A similar dynamic transmission effect can be found in many other modes of locomotion, allowing higher speeds to be achieved with lower propulsion speeds:

- When a speed skater or skier uses the skating technique, the force of the push is directed sideways, but the athlete moves forward faster than a runner who pushes the support straight back.
- Sailing yachts travel faster in side winds and even headwinds than in tailwinds, etc.

There are many publications in foreign literature on the mechanics and efficiency of oar blade operation [5, 6, 7], but this topic has not yet been sufficiently covered for domestic rowing specialists.

Objective of the study is to identify the main theoretical principles and measurement methods and provide practical examples of how to correctly determine the efficiency of a rowing blade in academic rowing.

Methods and structure of the study. Similar to other modes of locomotion, the efficiency of the oar blade is part of the total mechanical energy produced by the athlete, which is directed towards propelling the athlete-equipment system. When a rower applies force to the oar blade, it 'slips' through the water, i.e.,

there is a displacement of the fulcrum and a loss of power *Pw*, which can be defined as the scalar product of the force vector *F* and the velocity vector *Vbl* at that point by the cosine of the angle between them.

$$Pw = F\,Vbl\cos(\varphi) \quad (1)$$

These losses are deducted from the total power, and the remainder is the propulsive power that drives the entire system forward. The general definition of efficiency is the ratio of propulsive power to total power:

$$E_{bl} = P_{prop} / P = (P - P_w) / P \quad (2)$$

To measure these values, the BioRow telemetry system was used, which allows for accurate measurement of effort, oar angles and boat movement, and uses this data to reconstruct the trajectory of the oar in the water during the stroke.

Results of the study and discussion. When analyzing the blade movement in detail (during the working phase of the stroke cycle), the system allows you to determine the velocity vector *Vbl* at the center point of the blade, the angle of attack relative to the water *Aa* (it is important to take into account the bend of the oar), and the force applied to the center of the blade *Fbl*, which can be obtained from the force on the handle and the gear ratio. In this case, the center of the blade moves forward with the boat from the catch to an angle of approximately -25° before the perpendicular, and again after an angle of 15° after the perpendicular and until the end of the stroke, so that the blade moves backward only 35% of the stroke time and floats backward only about 12 cm. The outer edge of the blade floats back more (about 30 cm), but the inner edge of the blade does not float back at all and always moves forward with the boat. During the entire stroke, the center of the blade moves 1.68 m forward with the boat.

If the blade moves through the water at an angle of attack *Aa* different from 90°, then a lifting force *Flift* (hydro-lift) arises and the blade acts as an underwater wing. The hydro-lift force *Flift* is always directed perpendicular to the velocity *Vbl.w* and has 100% efficiency. All energy losses depend on the drag force *Fdrag*, which always has a direction opposite to the blade speed *Vbl.w*. *Flift* and *Fdrag* are components of the total reaction force *Freact*, which has the same magnitude and is directed opposite to the force on the blade *Fbl*. *Freact* is transferred through the oar shaft and broken down into the aforementioned *Fprop* and lateral force *Fside*, which does not cause energy loss as it is perpendicular to the boat's speed. It is important to note that any slippage of the blade in the water causes energy loss, regardless of direction, even if the blade is moving forward with the boat.

On average, the hydro-lift force provides about 56% of the total force on the blade, and the drag force provides the remaining 44%. The total drift of the blade centre along its curved trajectory is 1.7 m, and the total blade efficiency is 80.5%.

The equation determining the blade efficiency is quite complex and includes the blade drift speed *Vbl*, the force at its center *Fbl*, and the angle of attack *Aa* as well as the water density ρ, the blade area *S*, and the total drag coefficient *k* (which depends on the blade shape and angle of attack):

$$Ebl = 1 - \sin(A\alpha) / (k\,\rho\,S)^{0.5}\,Fbl^{0.5} / Vbl \quad (3)$$

This equation can be useful for determining the factors that affect the efficiency of a paddle blade:

The efficiency of the blade is higher at a steeper angle of attack *Aα* (*sin(Aα)* becomes smaller), which occurs at the beginning and end of the stroke.

The blade efficiency is higher when any of the factors $k\ \rho\ A$ increases: the blade shape is more efficient ($k\uparrow$), and/or the water density is higher ($\rho\uparrow$), and/or the blade area is larger ($A\uparrow$).

The blade efficiency is higher when the force on the blade *Fbl* is lower, which occurs at the beginning and end of the stroke, and (together with a sharper angle of attack) explains the increase in the efficiency curve. With the same force on the handle, the force on the blade is lower when the outer lever of the oar is shortened and/or the inner lever is lengthened, so the blade efficiency is higher with a heavier oar gear ratio. If the force on the blade approaches zero, its efficiency increases to 100%, but the blade does not create propulsion and becomes useless. For this reason, stronger rowers in a team usually have lower blade efficiency and vice versa (however, with some exceptions).

The efficiency of the blade increases at higher speeds *Vbl*, which depends on the speed of the boat. Therefore, the efficiency of the blade is higher in large, fast boats or in fast weather conditions (tailwind), even if the blade's slip remains constant and its performance in the water does not improve.

The last point above suggests that blade efficiency may not be a complete measure of the quality of the oar's performance, so we tried to find other indicators and developed the concept of the blade drag coefficient DF_{bl}, which is defined as the ratio of the force on the blade F_{bl} to the square of its slip velocity V_{bl} in the direction perpendicular to its axis ($DF_{bl} = F_{bl} / V_{bl}^2$). DF_{bl} does not depend on the speed of the boat, but becomes very high at the beginning and end of the stroke, when the blade's drift is small, which makes it difficult to analyze. It has been found that the average DF_{bl} is more than 100 times higher than the boat's drag coefficient (approximately 3 for

a single scull), which is the reason why it is possible to propel the boat-rower system forward.

With an average efficiency of around 80%, the oar blade is a fairly effective propulsion device, compared to 24% for the average physiological efficiency of a rower. Therefore, of all the metabolic energy consumed by the athlete, less than 6% is lost in the blade's descent, and most of it is dissipated as heat in the rower's body.

Various factors have opposite effects on the efficiency of the blade and the rower, so it is important to find the optimal balance between them. For example, a heavier gear ratio and a larger blade area increase the efficiency of the oar, but slow down the speed of the handle, which leads to a longer stroke time, a decrease in rowing pace and power, and can reduce the rower's efficiency and rowing speed. Also, a large blade makes it harder to catch and finish the stroke and can create more aerodynamic drag on the preparation.

Other factors have a unidirectional effect on efficiency components: since blade efficiency is higher at the beginning and end of the stroke, it is beneficial to quickly increase effort after catch and maintain it longer at the end, in other words, to make the effort curve more rectangular. This is also beneficial for both overall power and the effective dynamics of the rowing system.

Conclusions. The efficiency of the blade and its drag coefficient can be used to assess the quality of the equipment and the skill of the rower, but for the best sporting results, other components must be taken into account and their optimal balance found.

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Analysis of the institutional consequences of the isolation of Russian sport at the international level in the period 2022–2025

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Abstract

Objective of the study is to analyze the institutional consequences of the international isolation of Russian sport in 2022-2025, including the scope of restrictions, conditions for the admission of neutral athletes, organizational measures to overcome isolation, and the development of directions for the strategic institutional development of the sports system.

Methods and structure of the study. The methodological study is based on the principles of institutional analysis and a systematic approach. The following methods were used: content analysis (of normative acts and documents of the IOC, FIFA, FIG, and the Ministry of Sport of the Russian Federation); comparative historical analysis (by stages: 2022, 2023, 2024); expert evaluation of publications in the scientific and business press.

Results and conclusions. International isolation was not only competitive in nature, but also political and organizational, including the suspension of membership of organizations, cancellation of tournament participation, postponement of events, and exclusion from rankings. The partial admission of individual athletes under AIN (Authorized Individual Neutral) status was a formal compromise, but in fact only cemented institutional isolation for the long term.

Russia's adaptation strategies included restarting the national calendar, launching alternative formats (BRICS Games, Friendship Games), restructuring the reserve and developing the domestic competitive environment. The author concludes that a model of autonomous sports management has emerged, accompanied by risks of losing international competitiveness, distorting competitive motivation and limiting access to global standards.

Keywords: *international isolation, Russian Federation, neutral status, International Olympic Committee, sports.*

Introduction. Modern sport is not only a competitive system, but also a socio-political one, closely linked to international regulation, diplomacy, law and the media. Over the past decade, the Russian Federation has maintained a stable position in the global sporting structure, demonstrating high results and active participation in international organizations. Since 2022, under the influence of geopolitical tensions and subsequent decisions by international institutions, the Russian sports community has found itself in a state of unprecedented isolation. Following the official recommendations of the International Olympic Committee on 28 February 2022 [4], more than 30 international federations introduced measures restricting the participation of Russian athletes, teams and sports organizations in competitions, international structures and ranking systems [8]. Scientific interest in the topic of the international isolation of Russian sport has increased significantly since 2022. A number of publications have focused on the political and legal grounds for sanctions, the violation of athletes' rights and the influence of geopolitical factors on the sports sphere.

The legal mechanisms for restricting access to competitions, the status of neutral athletes, and the consequences for Russia's international reputation were also examined. The concept of 'sports sovereignty' was considered in the context of refusing to participate in institutions controlled by Western struc-

tures. However, despite the significance of these areas, the question of internal institutional consequences remains insufficiently explored: what adaptation mechanisms are being implemented at the level of the national calendar, reserves and federal management, and how is the model of autonomous sports functioning being formed?

This study fills this gap by offering a comprehensive overview of the key areas of internal institutional adaptation of the Russian sports system in the context of prolonged international isolation.

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The source base consists of: official documents from the IOC, CAS, and federations; analytical materials from the Ministry of Sport of the Russian Federation and the ROC; academic research in the field of sports law and management; reports on the conduct of alternative competitions.

Results of the study and discussion. By 2023, sanctions had been imposed on more than 30 sports. Most international federations refused to admit Russian national teams. Particularly harsh measures were introduced in team sports (football, basketball, hockey). Russian referees, officials and coaches were also excluded from international judging panels and registers, which deprived them of the right to participate in competitions under the auspices of international federations. In 2023, the IOC introduced the concept of a 'neutral individual athlete' – AIN [5].

Admission became possible only in individual sports and subject to a number of political and ethical requirements, including the absence of support for the SMO and an agreement with the international federation. This decision was criticized by sports and legal experts [9].

An analysis by sport (see Table 1) shows varying levels of isolation: from a complete ban on participation (football, hockey, volleyball) to limited admission under neutral status (gymnastics, wrestling, tennis). The greatest concessions were made to individual Olympic disciplines with a developed system of commercial tournaments. At the same time, a number of sports – athletics, luge, boxing – remain subject to strict restrictions, depriving athletes of international competitive experience.

Table 1. Subjects

Sport	Qualification	Gender, number of subjects, n	Age, years	Body length, cm	Body weight, kg
Cycling (track sprint)	HMS MSMK	M (n=6)	26±3	176±3,5	85,3±7,6
BMX cycling	MSMK MS	M (n=12)	23±4	182,4±6,3	81,0±5,5
		Ж (n=9)	22±5	164,4±3,8	62,3±7,7
Cross-country skiing	HMS MS of International Class MS	M (n=10)	23±4	179,8±6,2	72,5±6,7
		Ж (n=27)	17,7±4	168,0±3,4	60,6±4,7
Skating	HMS MS of International Class MS	M (n=37)	24±6	182,1±5,2	79,2±6,9
		Ж (n=33)	23±7	169,0±6,1	63,3±7,7
Rowing academic	MSMK MS	M (n=30)	22±6	192,3±8,2	89,2±11,2
Football	U16	M (n=51)	16±1	177,9±7,0	71,4±1,3

Table 1. Main restrictions by sport (2022–2024)

Type of sport	2022	2023	2024	Admission to AIN
Athletics	✖	✖	✖	No
Football	✖	✖	✖	Only U-17
Wrestling	✖	▲	▲	Yes
Gymnastics	✖	▲	▲	Yes
Hockey	✖	✖	✖	No
Swimming	✖	▲	▲	Yes
Figure skating	✖	▲	▲	Yes
Biathlon	✖	✖	✖	No
Tennis	▲	▲	▲	Yes
Volleyball	✖	✖	✖	No
Basketball	✖	✖	✖	No
Chess	▲	▲	▲	Yes
Fencing	✖	▲	▲	Yes
Karate	✖	▲	▲	Yes
Weightlifting	✖	▲	▲	Yes
Boxing	▲	▲	▲	No
Luge	✖	✖	✖	No
Rowing	✖	▲	▲	Yes
Speed skating	✖	✖	▲	Yes
Triathlon	✖	▲	▲	Yes

(*✖ – prohibition; ▲ – partial admission *)

The isolation was accompanied by the postponement of world championships, the cancellation of Cup stages, exclusion from rankings and the loss of licenses. In response, the Russian Ministry of Sport and the ROC took systematic steps to reorient the calendar: in 2023–2024, the BRICS Games, Friendship Games, and international championships were created on the territory of the Russian Federation [6, 10]. The participation of Asian and CIS countries was also intensified. At the federation level, internal ratings have been introduced, stimulating grants for juniors, and the standards for domestic competitions have been raised. Some federations (swimming, wrestling) have proposed a system of domestic cups with open participation [1].

The key risk remains the limitation of contacts with the strongest international schools. This reduces the level of training, the motivation of athletes and complicates the development of reserves. Thus, the Russian sports system has moved into a mode of autonomous mobilization [3], in which the main task is not to win on the world stage, but to preserve personnel, organizational and methodological potential in conditions of external blockade.

The international restrictions imposed on Russian sport in 2022-2024 were of varying degrees, ranging from a complete ban on participation to the admission of individual athletes under neutral AIN status [5]. This segmentation of restrictions has led to an uneven impact on sports and an institutional burden on the national sports system.

An analysis of the response of Russian organizations showed that sports institutions implemented a set of adaptive measures: from creating alternative international competitions to mobilizing internal selection and ranking mechanisms [1, 6, 10]. These steps partially compensated for the consequences of isolation, but did not remove the key barriers to full international integration.

In the context of continuing isolation, a model of autonomous institutional mobilization began to take shape [3], based on strengthening internal organizational resources and reorienting strategic priorities. The following areas of institutional development can be identified digitalization of management and training of athletes through the creation of national platforms for monitoring, analytics and regulatory control [11]; the development of sports diplomacy outside the framework of traditional international structures, based on coordination mechanisms for interaction with the federations of the BRICS countries, the CIS and the Global South [7]; and strengthening the scientific and methodological support for high-performance sport through the establishment of specialized centers of excellence, the introduction of independent evaluation of methodologies and the creation of domestic scientific platforms [2].

Conclusions. The institutional model that has been formed does not exclude external vulnerability, but sets a vector for sustainable autonomy focused on long-term development in conditions of limited international interaction.

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A systematic approach to the activities of a regional football federation (using the example of Krasnoyarsk Krai)

UDC 796

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Abstract

Objective of the study is to develop an algorithm for designing a systematic approach to the activities of a regional football federation (using the Krasnoyarsk Krai as an example) and to recommend its implementation in practice.

Methods and structure of the study. The study was conducted at the Krasnoyarsk Regional Football Federation between 2022 and 2024. The following research methods were selected to ensure the correct organization and implementation of scientific and theoretical work: analysis of scientific and methodological literature on the topic; questionnaires; interviews, observation, modelling; systematization; abstraction; testing, expert assessment, mathematical statistics, etc. In the process of collecting factual material, 150 coaches and specialists involved in the development of football in the region, as well as more than 800 children and young people who are systematically involved in football, were involved. All this contributed to identifying the overall level of activity of the regional federation and designing a systematic approach to improving the functioning of regional football.

Results and conclusions. The theoretical research conducted contributed to the development of an algorithm for designing a systematic approach to the activities of a regional football federation, as well as a systematic analysis of the federation's functioning; an experimental structure and content of a model for improving the activities of the existing regional football federation, based on taking into account the current requirements for the development of the football industry in the region, Russia and in global practice.

Keywords: *regional football federation, systematic approach, activity, design, improvement.*

Introduction. A systematic approach was used as the theoretical basis for improving the activities of the regional football federation (using the Krasnoyarsk Territory as an example). A systematic approach involves considering the object of study as a holistic system that includes a set of elements that together perform a specific function (activity). The following principles of the systematic approach were applied when developing the structure and content of the program for improving the activities of the regional football federation: integrity, hierarchy and structuring. The improvement of the activities of the regional football federation, based on a systematic approach, included the following algorithm: definition of basic management blocks and their tasks; a consistent structure of interaction between management blocks and a functioning process, including quantitative and qualitative performance indicators, was developed; corrective and effective blocks of the federation's activities were formed. The systematic approach to improving the activities of the regional football federation (using the example of the Krasnoyarsk Krai) was developed and designed in this methodological sequence.

Objective of the study is to develop an algorithm for designing a systematic approach to the activities of a regional football federation (using the Krasnoyarsk Krai as an example) and to recommend its implementation in practice.

Methods and structure of the study. The study was conducted at the Krasnoyarsk Regional Football

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Results of the study and discussion. Based on the results of the study, a model for designing a systematic approach to the activities of the regional football federation was developed (Fig. 1).

Figure 1 shows the stages of a systematic approach to developing organizational and methodological support for improving the activities of a regional football federation (using the Krasnoyarsk Krai as an example).

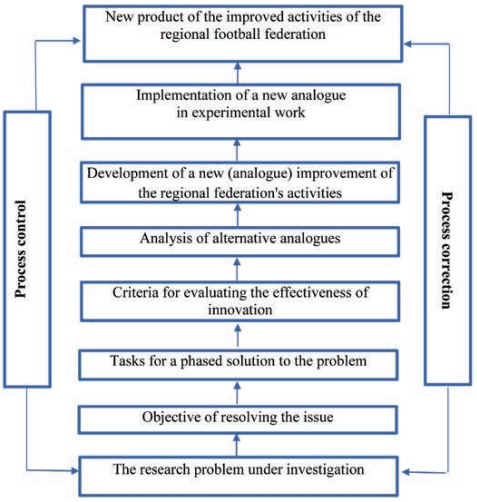

Fig. 1. Model for designing a systematic approach to improving the activities of a regional football federation.

Table 1 – Performance indicators for football federations: Europe (generalized, average), RFU (Russia) and the Krasnoyarsk region

Performance indicators of football federations	Football Federation		
	Europe (generalized, average)	Russia (RFU)	Krasnoyarsk Regional Federation
The mentality formed towards football among the population, in %	From 90% and above	Less than 20%	Less than 15%
The place (position) of football in the country, number	1st-3rd place	10th place	9th place
Football infrastructure provision (logistics), in %	90% and above	30 %	20 %
Availability of competent coaches and football specialists, in %	100 %	10 %	6 %
Provision of national teams with competent footballers, in %	100 %	25 %	10 %
Provision of competent referees for football competitions of various levels in the country	100 %	10 %	7 %
Funding for football activities at the state level, in %	40 %	30%	10 %
sponsorship	20 %	2 %	0,5 %
own financial and economic activity	40 %	0 %	0 %
Quality of training systems in football from children's sport to professional activity (career), in %	100 %	25 %	15 %
Functioning of state programs for the development of football in the country, number	Over 50	10-15	8-12
Total number of people playing football as a percentage of the total population	From 50% and above	1,5 %	1 %
The legislative framework for football development (football constitution) is in force.	Yes	No	No
Football business and management is functioning	Yes	No	No
Climatic and geographical conditions for year-round football activities, in %	90% and above	40 %	20 %

The presented model for designing a systematic approach to improving the activities of the regional football federation includes seven functional blocks that progressively form the goal, objectives, and scientific and methodological tools for achieving them.

Table 1 presents comparative indicators of the activities of football federations: Europe, the Russian Football Union, and the Krasnoyarsk Regional Federation.

A general analysis of the activities of football organizations in Europe, Russia (RFU) and the Krasnoyarsk region revealed the main problems hindering the development of football in Russia and what needs to be done to bring the football industry up to European standards.

Conclusions. The developed algorithm of a systematic approach to improving the activities of the regional football federation allows specialists and managers to quickly and effectively adjust and manage the football industry, both at the regional level and in Russia as a whole.

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Interpersonal interactions in the mobile-game environment of physical education

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Abstract

Objective of the study is to model a mobile gaming environment for physical education based on interpersonal interaction between participants in the process of communication.

Methods and structure of the study. 88 students majoring in education, aged 19.2±0.5 years, were involved in the scientific experiment as part of an experimental and control group in the process of physical education based on the modelling of team game situations involving the need for interaction to achieve a team result.

Results and conclusions. It has been established that the formation of students' communication competence for its subsequent implementation in the social sphere is possible through the means of a mobile game environment of physical education. Constant communication between players in a mobile game environment plays a central role in coordinating game actions.

Keywords: *physical education, game environment, game situation, communication, social skills.*

Introduction. The issue of researching the active play environment in physical education is quite complex and multifaceted. Among the main categories of the active play environment, we can distinguish the concepts of player, role play, team, game actions, and final result.

From the point of view of functional structure, game action is considered as a unit of functioning and analysis of the mobile-game environment, while social interaction fills it with the meaning of interactive communicative construction. Thus, the analysis of the mobile-game structure is based not simply on action, but on the interpersonal interaction of participants in the process of communicative communication.

In the case of passive observation, the structure of communication actions remains latent. A participant in active play activities on the playground simultaneously becomes a reflective subject of events, gaining a dual experience – motor and reflective. Therefore, the game roles of observers and participants in physical education classes can be combined and varied in various possible combinations. The visible structure of communication links manifests itself in team motor actions performed on the basis of mental operations.

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Communication in the process of active play-based physical education was viewed as the integration of information comprehension, message transmission, and understanding of the purpose of motor actions.

The main focus of developing students' communication skills was that participants in active play activities, based on an internal model of actions in accord-

ance with real game situations developing on the field, sought to make predictions and organise interactions aimed at effectively achieving the team's game results.

The factors of modelling team game situations that formed communicative competence were:

- diversity and non-standard nature of game interaction;
- integrated manifestation of game, thinking and communication components;
- variability of team interaction methods depending on changes in the tactical situation;
- diversity of player roles in group and team interaction.

Based on the results of an analytical study of the communication skills of students majoring in education, the following were identified:

- the ability to perceive the game actions of teammates;
- the ability to adjust one's own game tactics depending on the mistakes and miscalculations of teammates;
- knowledge of methods of pair, group and team interaction and mastery of the skills to implement them on the playing field;
- mastery of various playing roles, mobility in the implementation of playing functions;
- the ability to set playing goals aimed at achieving a team result, choosing the methods and means to achieve them;
- willingness to take charge of the game as a coordinating and connecting player;
- mastery of the skills of organization, coordination and objective assessment of the activities of teammates;
- ability to predict and plan tactical game situations.

The effectiveness of communication skills acquisition was assessed based on evaluation indicators set by physical education experts based on the results of students' physical and gaming activities.

The data obtained was processed using statistical analysis methods in the STATISTICA 10.0 program.

Results of the study and discussion. For sports games with increasing complexity and unpredictability of the outcome, the concept of conscious activity of their participants, who should be considered from the point of view of both the individual and the team, is fundamental.

Related to immersion in physical and gaming activities that require comprehension and communication of information, students' communication skills are formed on the basis of using and capitalizing on the forms and resources of the physical and gaming environment of physical education (Table 1).

Due to the unpredictability of game situations, participation in active play activities had unequal educational potential for students participating in classes. Since each participating player acted according to their own skills in solving game situations, the temporary distribution of game events was determined by the sequence of development of local game situations.

The dynamics and interactivity of the game are characterized by the fact that the emerging game situation cannot be completely stabilized in time and space, and the initiative passes from one team to another. It follows that the game is not just a set of observable tactical situations, but is determined by systemic actions and combinations that determine the course of game events.

The actions of players in tactical game situations are interrelated until the objectives and target result of the game are achieved. For players, tactical game situations are defined as actions, and for the mobile game environment, as communication.

The closed-type model described implies the possibility of reflection. In the current game situation, players perceive it and then update their actions to change the emerging situation. When information is not only received but also played out in practice by a participant, it acquires meaning and can be retransmitted to teammates. In this case, the mobile game environment has an additional function, which is distributed meaning.

Since a game, as a set of game situations, contains a certain degree of uncertainty, it can only be identified by adopting a certain goal. While in biological systems a signal performs the function of transferring information, in communication systems in the process of mobile-game activity there is not only the function of transmitting information, but also of endowing it with meaning. As a result, communication takes place on two levels simultaneously – content and meaning – which are not automatically linked, but are constantly reconstructed and thus contain uncertainty.

The communication system and game actions were mutually supported through structural pairing. Game events have two levels. At each moment of the game, there are both game events and the individual perception of the same events by different players. These levels are in constant interaction.

Simultaneous communication on two levels is only possible when a person is a conscious participant in

Table 1. Assessment of students' communication skills

Name of competencies	Average score		p
	ЭГ	КГ	
Ability to perceive the actions of teammates	4,2±0,6	3,8±0,1	<0,05
Ability to adjust one's own playing tactics depending on the mistakes and miscalculations of teammates	4,5±0,2	4,2±0,2	<0,05
Knowledge of methods of pair, group, and team interaction and mastery of the skills to implement them on the playing field	4,0±0,5	3,4±0,1	<0,05
Mastery of various playing positions, mobility in performing playing functions	4,6±0,3	3,8±0,2	<0,05
Ability to set game goals aimed at achieving team results, choosing ways and means to achieve them	4,0±0,3	3,7±0,4	<0,05
Willingness to take charge of the game as a coordinating and connecting player	4,1±0,3	3,5±0,6	<0,05
Mastery of skills for organizing, coordinating, and objectively evaluating the activities of teammates	4,3±0,8	3,6±0,2	<0,05
Ability to predict and plan tactical game situations	4,3±0,5	3,8±0,4	<0,05

the event, and only then can they interact. The result of the interaction can be viewed as an event in which each participant communicates meaningfully.

Unlike a formalized description, the mobile gaming environment is limitless due to its complexity.

Conclusions. The development of students' communication skills for subsequent application in the social sphere is possible through the use of a mobile game environment in physical education.

Regardless of the level of functioning, the mobile game environment is a product of the interactions between players in a team. The game system is built on the technical actions of the player and the corresponding reactions of teammates, which is determined by the dynamics of the mobile-game environment. To achieve coordination of actions, players must be relatively independent in their decision-making. Constant communication between players in the mobile-game environment plays a central role in coordinating game actions.

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Development of motivational and value orientation of personality in physical culture and recreational activities

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Abstract

Objective of the study is to reveal the internal psychological mechanisms that motivate individuals to engage in physical and recreational activities.

Methods and structure of the study. The methodological basis was built on the intersection of theoretical and empirical approaches based on a comparative analysis of the practice of organizing physical culture and recreational activities.

Results and conclusions. The highlighted values of physical culture and recreational activities are general in nature. They may vary in intensity, component content, and hierarchy within an individual's overall system of life values. Social relations undoubtedly play a key role in shaping an individual's motivational and value sphere.

Keywords: *physical culture, physical recreation, motivation, personality, psychological mechanisms, theoretical and empirical approaches.*

Introduction. The relevance of developing a modern motivational and value-based concept of physical recreation, clarifying its basic concepts, essence, and patterns of functioning in modern Russian society is due to two contradictions.

Firstly, there is an increase in society's need for physically healthy people as the main source of socio-economic potential growth. At the same time, never before have the acceleration of the pace of life, the monotony and intensification of industrial labor, local inter-territorial conflicts, the low standard of living of most Russians, rising unemployment and uncertainty about the future led to such a sharp deterioration in the general health of the population.

Secondly, the search for effective means of solving the problems that have arisen and the focus of state and public organizations on physical recreation, optimizing the health of the population, organizing leisure activities and the socio-cultural development of the individual, contradicts the insufficient development in modern science of the social phenomenon of physical recreation itself, its concepts, essence, patterns, and the determination of ways and conditions for realizing its potential in solving problems of practical importance [1, 2].

The main contradiction in this case is that, despite the accumulated knowledge about physical recreation and its possibilities, its role in the socio-psychological and socio-cultural development of the individual is not taken into account. This is explained by the diversity of methodological approaches to the problem of motivation under study and the lack of clearly defined components in terms of both qualitative and quantitative composition. It should also be noted that the participants in the observations are mainly pupils of educational schools and students of higher educational institutions. Only a few cases are devoted to the study of motivation for physical culture and recreational activities among cadets, military personnel, and workers of various professions.

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parative analysis of the practice of organizing physical culture and recreational activities.

Results of the study and discussion. The Guidelines on Physical Training and Sports in the Armed Forces of the Russian Federation note that, in addition to compulsory physical training classes for military personnel, independent forms of exercise during free time are also provided for. Independent activities for military personnel are organized on a voluntary basis, taking into account their accessibility and the needs and interests of individuals in specific types of physical and recreational activities, and should contribute to the organization of military personnel's free time and the optimization of their mental and physical health.

The task of physical recreation is to reveal the internal psychological mechanisms that stimulate the subject to engage in physical culture and recreational activities. Motivation is not one of the components of activity stimuli, along with needs, interests, inclinations, attitudes, etc., but acts as the basis of a complex system – the motivational sphere of the personality. The motivational sphere of the personality is understood as the totality of impulses that initiate and regulate various types of activity [3].

The study did not aim to provide a detailed analysis of all existing concepts of motivation in domestic and foreign science; it only considered the aspect of the problem that is directly related to the subject's motivation for physical culture and recreational activities. In psychological activity theory, the central, system-forming feature is the 'motive-goal' vector.

An in-depth study of the psychological patterns of motivation for physical culture and recreational activities is only possible on the basis of psychological theories of personality and activity. The personality acts as the subject of physical culture and recreational activities, and it is the psychological characteristics of the personality that determine its motivation. In domestic science, research into the motivation for physical culture and recreational activities is predominantly empirical in nature and does not sufficiently rely on any theoretical concept of motivation, personality theory, or activity theory.

It is necessary to use a variety of scoring scales to create a universally recognized classification of motives for physical culture and recreational activities and a unified assessment of their expression in subjects from different socio-demographic groups. Studying the differences in motivation between adolescents and university students, it was found that adolescents are more physically active in their free time than students.

Accordingly, 63% and 36.9% of respondents in these groups participate in sports clubs, belong to a specific social group of informal communication with peers, and strive for independence and emotional contact [4].

Regardless of gender differences, health and hygiene motives occupy a leading place. S.N. Rekhovskaya [6] found that military personnel, unlike representatives of the working professions, are more active in physical culture and recreation – the former are more motivated by the recreational aspect of physical activity than representatives of the working professions.

According to A.V. Kharitonov [7], officers are the most physically active in their free time, followed by cadets at educational institutions, with conscripts being the least active.

In the psychology of physical culture and sport, the classification of motives by A.N. Nikolaev [5] deserves attention. The classification proposed by the author is essentially universal and can be used in studies of any type of activity (educational, labor, military, sports, etc.). The author identifies several groups of motives, each of which equally represents cognitive, emotional, and behavioral components. This classification of motives allows us to consider the problem of motivation from the point of view of the subject and psychological theory of activity, and is quite applicable to the study of the motivation of the subject's physical culture and recreational activities. However, motivational models of physical recreation based on the interrelationships between the organism and the environment or only on the socio-demographic characteristics of subjects do not fully reveal the motivation for physical and recreational activities. They are basic only in the sense that they contribute to the adaptation of different individuals to the conditions of their existence.

The motivational sphere of subjects engaged in physical culture and recreational activities is the starting point for their activities, the stimulus for their actions. On this basis, value orientations are formed: subjective attitudes of the individual (B.F. Lomov), ideas about what is desirable, influencing the choice of behavior (T. Parsons), socially conditioned attitudes of the individual towards the totality of material and spiritual goods and ideals that have a certain value.

Three main specific features of physical recreation as a value can be identified: voluntariness, accessibility and socio-cultural orientation. Voluntariness is expressed in the absence of external coercion to engage in recreational activities, independence in choosing the forms and

means, places and conditions for its implementation, the absence of strict regulatory requirements for its implementation, the expression of will in choosing partners for joint activities, etc. Accessibility is expressed in the fact that the variety of types and forms of physical recreation allows one to choose types that correspond to the individual characteristics of the subject, their physical health, physical and mental abilities and capabilities [8, 9, 10].

They may have different degrees of expression, component content, and hierarchy in the overall structure of values of different social groups and specific individuals. In the formation of the motivational and value sphere of the subject of physical culture and recreational activity, the main role is played by existing social relations.

According to S.L. Rubinstein, orientation is a set of conscious life aspirations and ways of expressing them, the most important and most generalized component of the personality structure. Despite the ambiguity of the term 'orientation' as used in pedagogy, psychology, and other social sciences, it should be noted that it is a set of dominant needs, motives, and values of a person. It is relatively stable and determines the goal and content of a person's activities.

Conclusions. The motivational and value orientations of individuals engaged in physical culture and recreational activities may vary greatly from person to person. Depending on their psychophysical development and state of health, each individual may have different motivational and value orientations and priorities in terms of the content and focus of their individual physical culture and recreational activities.

The contradictions noted allow us to formulate the problem of this study: clarifying the modern concepts of the term 'physical recreation' will significantly expand our understanding of this social phenomenon and show its importance in improving the health of the nation.

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The role of sport in world cinema as a socio-political tool

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Abstract

Objective of the study is to determine the significance of sport at the international level, including its growing importance and influence on media societies as a political tool.

Methods and structure of the study. Based on an analysis of literary and statistical international databases, a comparative analysis was conducted, combining quantitative and qualitative methods to study the place of sport in European and Russian cinema and its connection with broader political and ideological messages. Media texts from national federal media served as the empirical basis.

Results and conclusions. The theme of sport in cinema emerged with the creation of documentary filmmaking and the development of scientific and technological progress, sport and culture. The sports genre has become a leading genre in world cinema, coexisting with other film genres. Sports films reflect social changes, public demands and the culture of individual nations.

In each country, a particular sport dominated at a certain period of time, and the Olympic Games were the apogee of the politicization of international sporting competitions, which left its mark on the content of films. Films on this subject are a tool for competition between countries, not only at the Olympic Games, but also in the cinema space, based on the number of films produced and their influence on European society, as confirmed by research into European and Russian sports cinema.

The film projects themselves are aimed at generating audience interest in leading a healthy lifestyle and participating in amateur sports. At the federal level, sports films play another important role in articulating and affirming existing power structures and ideological hegemony in Russian society, especially during a particularly difficult period of national and international instability and controversy.

Keywords: *sport and physical education, cinema, international level, socio-political role.*

Introduction. Culture and social norms are reflected in cinema. Cultural studies scholars note that cinema acts as a mediator in shaping public opinion and establishing hegemonic ideologies through the transmission of socio-cultural norms. The state, in turn, is interested in the development of the film industry, since film distribution in the international media environment shapes the image of the country and conveys its values.

The sports genre in cinema plays an important role in international competition at the economic, cultural, sporting and personal levels. In world cinema, there is a battle for box office takings between national films and Hollywood, which has played a central role in defining and popularizing the genre. Thus, the theme of sport became popular around the world, and in 2008, in a special television broadcast on the American channel CBS, the American Film Institute recognized that the sports genre was the leading genre in American cinema.

Objective of the study is to determine the significance of sport at the international level, including its growing importance and influence on media societies as a political tool.

Methods and structure of the study. The article analyzed works related to the analysis of specific films about the history of sport (including basketball) in Europe and internationally [3, 4], as well as the portrayal of sport in cinema and other visual media [1, 7]. For example, a 1960s study by historian John B. Kuyper [6] on American films about the Civil War noted that films made during a particular decade or year can be

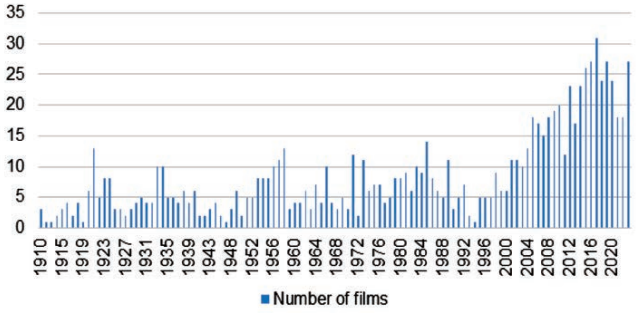

Fig. 1. Diagram showing European sports film production between 1910 and 2022.

an indicator of the opinions, attitudes, and concepts of both filmmakers and viewers of that period.

In-depth quantitative studies in the American context were conducted by a number of foreign scholars, who identified 590 American films from that period and examined various obvious trends, including the social and cultural significance of sport and its evolution.

In the process of analyzing sports in European films, difficulties arose with the statistical database. For example, existing databases at the European level, such as The European Film Directory and the Internet Movie Database (IMDb), include only feature-length films, while short films and documentaries about sports are absent. In addition, there are linguistic problems in classifying films as sports films, given the multi-genre nature of cinema. The sample includes films in which sport is the key theme of the plot.

Results of the study and discussion. The pinnacle of the politicization of international sporting competitions was reached with the Olympic Games, which more often than not serve as an arena for political struggle and a tool for propaganda and the promotion of ideologies. Over time, issues of physical culture and national achievements began to feature on the agenda of the media and cinema, and interest in sport began to emerge at the very beginning of the 20th century.

The popularization of artistic cinema and the development of scientific and technological progress contributed to the development of a variety of sports films. Thus, from documentary films during World War II for propaganda purposes (e.g., Olympia (1938)) to dramatic films based on real events (e.g., Champion (1949)), where sport served as a backdrop for the dramatic plot to the main sporting theme of the film. Later, sports-themed films began to receive Oscars. For example, the film Rocky showed that sports films can be not only entertaining, but also artistically significant.

According to the results of an analysis of films from a sample of 37 European countries, where the main theme was sports, there has been an increase in the production of such films from 1910 to 2023 (Fig. 1). A distinctive feature of the study of the sports genre was the problem of selecting films, as there are many films with similar themes touching on sports, so the study is based on feature-length films that were shown in cinemas and whose main storyline is devoted to sports.

Each country has its own popular sports at a given time, which are reflected in feature films. Based on research, European films over the past 113 years reflect a number of characteristics. More than 25% of films are devoted to football as a key sport, followed by boxing, horse racing and athletics.

In addition, different sports were popular at different times and in different countries, reflecting social changes and public preferences. For example, in the UK, horse racing is preferred, so films about this sport accounted for only 9% of the total.

However, in the 1920s, about 50% of all films were dedicated to horse racing, as it was positioned as an important interwar sport in Britain [5]. The most active countries in terms of film production or co-production of sports films are: the United Kingdom, Germany, France, the Soviet Union (later the Russian Federation), Spain and Italy.

At the federal level, sport acts as a political tool in the strategy to promote nationalism, and Soviet references to sporting achievements serve as a model of heritage. The Russian Federation has its own sporting heroes who have been featured in films. For example, the 2013 film Legend No. 17, about the rise to fame of legendary Soviet ice hockey player Valery Kharlamov, was also a commercial success.

Thus, cinema contributes to raising the country's profile on the international stage, playing an important role in the cultural and economic life of the country.

Even a single film can reflect the political situation and public opinion at the national and international levels, highlighting the country's importance through its sporting history.

Conclusions. Sports films are not only entertainment, but also an important political tool for shaping national identity. Over time, sports films have transformed, reflecting not only changes in cinema itself, but also the evolution of society's perception of sport.

The authors summarized international and, in particular, European research in the field of sport as a film genre and journalistic agenda over a certain

period and found that cinema acts as a projection of a particular nation's perception of sport. Society's view of sport is expressed through cultural creativity – film production. In each country and in each period of time, one or another sport dominated, and sports games served as an instrument of cultural capital in the international arena, where the Olympic Games became the apogee of the politicization of international sports competitions.

Research into the evolution of sports cinema reflects the development of sport in Europe since the beginning of the 20th century, and the methods of presenting film material and the director's vision have shaped the norms, values and understanding of the sports themes presented. Football is the most popular sport represented in European sports cinema. At the same time, certain sports came to the fore in different eras, reflecting larger social changes. With the increase in the production of sports films since the 1970s, the types of sports represented on screen have expanded and there has been a transition to related genres – drama instead of comedy. In terms of national production volumes, the United Kingdom and the Russian Federation have been in the lead since the early 2000s.

Hollywood, in turn, played a central role in defining and popularizing the genre, and the popularity of Hollywood films influenced the perceptions and preferences of viewers who are oriented towards entertainment content. The audience's familiarity with this type of film masterpiece shaped their standards for cinema in European countries.

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Leading sensory modality in physical education for schoolchildren with disabilities

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Abstract

Objective of the study is to investigate the leading modality of perception in schoolchildren with mental retardation and to develop methodological recommendations for organizing physical education classes, taking into account the leading type of perception of the students.

Methods and structure of the study. 20 schoolchildren of early adolescence with mental retardation were examined at Secondary School No. 8 in Ishim, Tyumen Oblast. The experimental study used observation, the 'Leading Modality' methodology developed by the authors, the 'Concept Exclusion' and 'Concept Relation' thinking study methodologies, the Raven's test, and 'Classification.'

Results and conclusions. The leading modalities of perception in adolescents with mental retardation have been identified, and a higher level of development of visual-figurative thinking than verbal-logical thinking has been established. The differences found are statistically significant. Student's t-test was used to assess the reliability of the differences. Methodological recommendations for organizing physical education classes taking into account the leading sensory modality of students were proposed.

Keywords: *mental retardation, primary school students, sensory modality, inclusive education.*

Introduction. The current requirements of the Federal State Educational Standards for primary general education for students with disabilities indicate the need to correlate the characteristics of psychophysical development and individual abilities of students with the development and implementation of adapted basic general education programs in an inclusive environment. Due to the dynamic changes currently taking place in education, it is becoming increasingly important to study the individual psychological characteristics of students with disabilities and to select the forms and methods that most fully correspond to the principles of personality-oriented education[1].

Today, more and more researchers are turning their attention to the problem of differentiating teaching according to the leading modality of perception. The authors study the influence of teaching that takes into account the leading modalities of perception on the improvement of cognitive activity, the level of academic motivation and knowledge acquisition, and the development of cognitive functions. They develop methodological recommendations, methods, and pedagogical technologies for working with modalities [2, 6].

T.S. Afanasyeva and N.I. Grishakina analyzed the effectiveness of different methods of teaching university students and showed the influence of different types of representative systems on the effectiveness of information perception [1].

The theory of neurolinguistics programming develops the concept of a representational system (M. Grinder, L. Lloyd, H. Alder, et al.) [4, 7]. A representational system is understood as the preferred method (channel) of receiving, processing (encoding), and storing information coming from the outside world. Researchers adhere to the idea that the sense organ that provides the best assimilation of incoming information is the leading mode (modality) of perception, distinguishing between visual, auditory and kinesthetic

[1] Federal State Educational Standards for Primary General Education of Students (students with disabilities). Order of the Ministry of Education and Science of Russia No. 1598 of 19 December 2014. Revised version of the Order of the Ministry of Education of the Russian Federation dated 8 November 2022. URL: https://fgos.ru/fgos/fgos-1598/ (data pf access 17 March 2025).

modalities of perception. Students with a leading auditory modality perceive information best by ear. Visual learners absorb information better in a visual form using graphs, diagrams, tables and drawings. Students with kinesthetic modality receive information in the process of performing practical actions with it. They need physical activity in their learning and are oriented towards tactile and motor sensations. In the process of communicative interaction with students who have a leading visual modality, the following marker words are used: observe, look, show. The following marker words are used with auditory learners: listen, repeat, explain, reason, discuss. For kinesthetic learners, the following marker words are used: feel, sense, perform, select.

In our opinion, the kinesthetic method of obtaining information is not equivalent to visual and auditory methods of perception. In the process of cognizing the surrounding reality, a person uses all their senses, but the main channels for obtaining information are one or two [3]. Kinesthetic sensations are closely related to all types of sensations coming from different senses, are part of a complex system of inter-sensory connections, and are necessary for the perception of objects in visual, auditory, and other modalities. The leading modalities of perception are visual, auditory, and mixed.

The kinesthetic channel of perception provides perceptual activity when solving visual and auditory tasks in preschool age. In a study by E.P. Shcherbakova and S.V. Vetrenko, it was noted that in the process of solving perceptual tasks, children with right-brain and left-brain interhemispheric asymmetry at the ages of 5 and 6 use kinesthetic more often than younger schoolchildren [3, 10].

The problem of developing perception in children with mental development delays is currently the subject of scientific work by I.Yu. Murashova, V.I. Nodelman, V.A. Bandurina, and K.V. Lytkina. I.Yu. Murashova and V.D. Nodelman analysed and summarised scientific ideas on the development of polymodal perception in children aged 6–11 with severe speech disorders and mental retardation [8, 9]. The authors point out that studies of polymodal perception in children with severe speech disorders and mental retardation have revealed negative manifestations in its structure. The development of polymodal perception in children with severe speech disorders and mental retardation is carried out using a technique based on a multisensory method of presenting information in a differentiated learning environment. The multisensory method can also be used by all teachers and in all lessons in an inclusive environment. In this regard, there is growing interest in modern methodological support for differentiated education of students with disabilities in the same classroom as healthy children.

Objective of the study is to investigate the leading modality of perception in schoolchildren with mental retardation and to develop methodological recommendations for organizing physical education classes, taking into account the leading type of perception of the students.

Methods and structure of the study. The experimental study was conducted between October and December 2022 with junior high school students (n=20) from Secondary School No. 8 in Ishim, Tyumen Oblast, who had mental development delays. According to medical examination data, none of the subjects had significant pathologies of the visual, auditory, or tactile-kinesthetic analyzers.

At the first stage, we studied auditory, visual, and kinesthetic ways of perceiving information and determined the leading sensory modality. To this end, observation was used with behavioral indicators of the leading modality developed in NLP theory, the author's methodology 'Leading Modality' (a modified version of the methodology for determining the leading modality and sensory activity of each modality in primary school children by I.Yu. Ladokhina) [5].

In the second stage of the study, visual-figurative and verbal-logical thinking was studied using the 'Exclusion of Concepts,' 'Relationship of Concepts,' Raven's Test, and 'Classification' techniques. When evaluating the results, the number of correct answers, the number of errors, and the predominant characteristics (external, functional, class-generic relationships, etc.) were noted. In each series, the average value was calculated using the methods used. The third stage of the study consists of developing methodological recommendations for organizing physical education for adolescents with mental retardation, taking into account their leading sensory modality.

Results of the study and discussion. The results of studying the leading modality of perception in adolescents with mental retardation are shown in Fig. 1. As the diagnosis showed, 75% of adolescents most often use visual perception, while 25% use auditory perception. Kinesthetic modality manifests itself in both auditory and visual modes of perception.

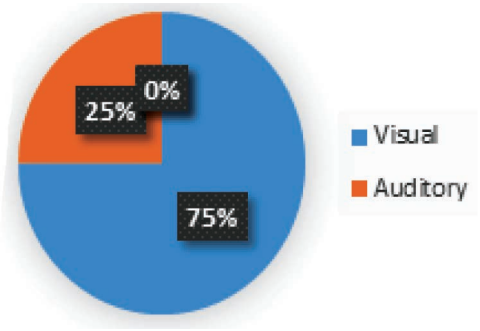

Fig. 1. Study of the leading modality of perception

Thus, most adolescents with mental retardation have a leading visual modality of perception.

The results of studying verbal-logical and visual-figurative thinking in adolescents with mental retardation are presented in Fig. 2. A low level of verbal-logical thinking was found in 35% of students, an average level in 65% of adolescents, and no high level was identified. A low level of visual-imaginative thinking was found in 15% of adolescents, an average level in 55%, and a high level in 30%.

Thus, adolescents with mental retardation showed a higher level of visual-figurative thinking than verbal-logical thinking. The differences found are statistically significant according to Student's criterion ($p < 0.05$). It is well known that children with mental retardation have specific characteristics in the development of their cognitive functions. Without visual support, adolescents find it more difficult to perform verbal tasks, probably because, according to modality theory, incoming information from the auditory modality must be translated (translated) into the leading visual modality, which takes time and leads to a partial loss of information.

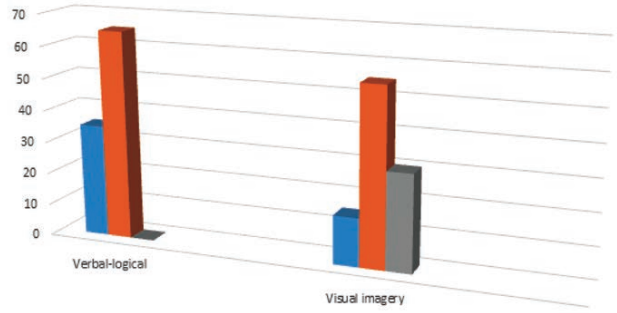

Fig. 2. Studying the level of cognitive development

In his scientific works, Russian neuropsychologist A.R. Luria [7] developed a theory about the interconnected, polymodal work of different types of perception and proposed the principle of relying on polymodal afferents. The principle of relying on polymodal afferents underlies the multisensory method of presenting educational information, allowing the development of polymodal perception in students with disabilities. From the perspective of a multisensory approach, teaching methods and techniques are used that do not focus on only one channel of perception, while taking into account the specifics of the leading modality of perception: tasks that involve each mode of perception (sight, hearing, movement dynamics). This method is used in individual and frontal teaching methods.

In the process of communicative and verbal interaction, words addressed to the leading sensory modality are used. The teacher needs to combine the explanation of the learning material with a visual demonstration. Students with a leading visual modality absorb information in a visual form, using logical diagrams, graphs, charts, and tables. For auditory learners, it is important to hear the teacher's explanation and engage in dialogue in order to understand the learning material.

The use of modern information technologies, digital services, and multimedia teaching tools (electronic textbooks, presentations, video and audio materials) that combine text, sound, and images also allows information to be received and processed through any channel of perception, engaging several senses. During the lesson, the teacher needs to take into account the low cognitive activity of adolescents with mental retardation, which is combined with rapid fatigue. Rapid fatigue leads to a decrease in performance, which manifests itself in difficulties in assimilating the learning material.

Conclusions. Most of the adolescents with mental retardation who were examined have a leading visual modality of perception and a higher level of development of visual-figurative thinking than verbal-logical thinking. The data from the study indicate the effectiveness of various forms, methods, and techniques for teaching schoolchildren with mental retardation that are used in inclusive education.

Polymodal perception is considered important in the cognitive and speech development of students with disabilities. The development of polymodal perception is facilitated by the method of multisensory presentation of educational material. The introduction of new technologies and methodological approaches in the joint education of children with disabilities and normally developing children occurs with the special

methodological training of teachers implementing inclusive education to create optimal conditions for their education, upbringing and socialization.

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Study of the motor mechanisms of the underwater phase of the start of a para-swimmer with unilateral lower limb deficiency

UDC 796.015+797.21

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Abstract

Objective of the study is to identify and describe the mechanism of underwater wave-like swimming in swimmers with unilateral lower limb deficiency.

Methods and structure of the study. Video recording of the underwater phase of the start and analysis of video materials, stereoscopic analysis of movements with measurement of fluid flow velocity and vortex formation, assessment of the range of rotation of the leg joints, mathematical and statistical methods were used.

Results and conclusions. It has been established that the mechanism of propulsion in the underwater phase after the start in swimmers with lower limb deficiencies differs from that in healthy swimmers in that they are unable to generate paired vortices and move by releasing a vortex created by only one leg. At the same time, a large vortex around the foot is created when striking downwards, and a small one when striking upwards. The range of hip rotation in swimmers with an amputated leg is smaller than in healthy swimmers.

Keywords: *swimming, underwater start phase, para-swimmer, unilateral lower limb absence.*

Introduction. World Para Swimming rules allow the use of underwater propulsion in swimming competitions for a distance of 15 meters from the wall after the start and after the turn. In this section, most swimmers use a wave-like body movement technique called underwater undulation swimming (UUS) [5] or 'diving'. In healthy swimmers, UUS results in pairs of vortices being generated by the movements of both legs, which collide with each other during the internal and external rotation of the hip joint to generate greater momentum and thus provide the driving force in the underwater phase [3, 7, 9]. In this regard, it has been shown that hip and ankle joint rotations are necessary for the collision and release of vortex pairs generated by both legs [7, 9]. This fact implies that the mechanisms of propulsion may differ between healthy swimmers and swimmers with a missing lower limb who perform movements with only one leg.

The mobility of the swimmer's foot is particularly important for the effectiveness of movements in the UUS phase. Therefore, it seems appropriate to assess small-amplitude oscillations of the ankle joint from side to side (inversion, eversion), the range of flexion, extension, abduction and adduction angles of the foot. Paraplegic swimmers with a deficit in one leg begin the movement by moving the intact lower limb up and down, while maintaining the correct body position with both arms raised. However, it remains unclear what kind of vortex is generated around the paraplegic swimmer's intact leg and what momentum is gained during these movements.

Objective of the study is to identify and describe the mechanism of underwater wave-like swimming in swimmers with unilateral lower limb deficiency.

Methods and structure of the study. Understanding the specific propulsion mechanism will help coaches and instructors effectively select a set of corrective measures to increase the swimmer's speed in the underwater phase after the start. Foreign studies have also attempted to elucidate the propulsion mechanism by visualizing the flow around a healthy swimmer using 3D-PIV software [5, 6, 9]. The design

of this study was implemented using 3D modelling of the movements of a paraplegic swimmer with lower limb amputation with stereo analysis of visual points using Dartfish Pro software. Underwater video recording was carried out with the participation of a para-swimmer (male, MS, height 172 cm, weight 72.5 kg, right lower limb amputation, sports-functional class S9).

The para-swimmer's task was to perform 10 trial UUS (on the chest) in the pool environment with maximum effort, lasting about 10 seconds. Five synchronized high-speed cameras with a motion capture system were installed at the bottom and side walls of the pool. LED sensors were attached to marker points on the swimmer's toes, ankle, knee, and hip joint [1, 4].

In the study, one UUS cycle was divided into eight phases based on the marker positions of the toes, of which four phases involved upward leg movements and four involved downward leg movements. The position of the swimmer's body in the water was taken as the central horizontal axis. Using 3D analysis of video recordings, the amplitude and frequency of the healthy leg kicks, the angles of rotation of the hip, knee and ankle joints, and the vertical speed of foot movements during upward and downward kicks during undulatory movements in the underwater phase were calculated.

To analyze the water flow and measure the velocity of fluid flows, PIVlab software was used, which, based on an instantaneous assessment of the velocity of bubbles, allows the vortex velocity to be measured and the components of the water flow vector around the foot to be assessed in three-dimensional space. MATLAB software and calculations based on equations [8] were used to measure water flow velocity and vortex flows.

Results of the study and discussion. The table 1 shows the processed measurements of kinematic indicators in the underwater phase of the start performed by a para-swimmer with lower limb amputation.

It was found that swimmers with amputated lower limbs move by releasing a vortex created by their remaining leg. At the same time, the actual range of hip rotation was approximately two times smaller than in the results of a study of healthy swimmers [7], according to which the range of hip rotation was 34.24 ±9.45 .

It was also found that at the end of the downward stroke of the left foot, a vortex formed on its dorsal side, which then resorbed. During the upward stroke, a small vortex was observed, its size was insignificant and the water flow velocity was lower than during the downward stroke. A strong water flow around the foot was observed during the downward stroke, in a vertical direction from the middle to the end of the stroke. At the end of the downward kick, a skew (roll) of the pelvis was detected: the swimmer's right hip joint (with stump) was shifted towards the head, and the left hip joint was shifted towards the legs, while the intact (left) leg was located at the level of the central axis of the body.

Along with this, it was determined that at the moment when the para-swimmer moved his healthy leg towards the center of the body, the hip joint of the amputated leg was directed towards the head, and the

Table 1. Average values of kinematic indicators of the S9 class paraplegic athlete during the underwater phase after a ventral start

Kinematic indicators	M±SD
Kick amplitude, m	0,4±0,05
Kick frequency, Hz	1,1±0,13
Maximum vertical foot speed during downward kick in the underwater phase, m/s	1,8±0,2
Maximum vertical foot speed during upward kick in the underwater phase, m/s	1,5±0,13
Range of internal and external rotation of the hip joint, degrees	15,7±6,3
Range of flexion and extension of the hip joint, degrees	19,9±9,1
Range of adduction and abduction of the hip, degrees	6,1±3,5
Range of flexion and extension of the knee joint, degrees	55,1±4,7
Range of inversion and eversion of the foot, degrees	11,5±4,3
Range of plantar and dorsal flexion of the ankle joint, degrees	22,0±2,7
Range of adduction and abduction of the ankle joint, degrees.	23,1±3,7

Note: M – mean value, SD – standard deviation for the sample.

hip joint of the healthy leg was directed towards the foot. We believe that the swimmer moved his foot towards the center of his body by means of lateral flexion movements of the torso, rather than by adducting the hip or foot, and that the range of hip rotation may be less critical for swimmers with one leg than for swimmers with both working legs. Perhaps this was a strategy (unconscious or intuitive) dictated by the need to develop an individual swimming technique for the most effective propulsion using the momentum of only the intact leg. However, the latter requires the setting of a specific task [2], which could potentially be solved in an individual psychological study.

Conclusions. It has been established that a swimmer with a unilateral lower limb deficiency is propelled by the vortex created by only one leg during wave-like movements in the underwater phase, followed by the emergence of a propulsive impulse. Swimmers with lower limb deficits obtain maximum momentum for propulsion in the water at the end of the downward kick. However, the range of rotation (internal and external) of the hip required to generate this propulsive force is significantly less than that of healthy swimmers.

In the future, a comparative analysis of movements and water flows among swimmers with a single leg deficiency who have different swimming speeds in the underwater phase of the start should be conducted, as well as a comparative analysis of swimming speeds in the UUS phase before and after training activities, in order to obtain additional information about the possibilities for improving the starts of para-swimmers with limb deficiencies.

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Analysis of the statokinetic stability of track and field athletes with mental retardation in annual sports training cycles

UDC 376

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Abstract

Objective of the study is to assess the statokinetic stability of athletes with mental retardation in a year-long sports training cycle using stabilometry.

Methods and structure of the study. 8 men with mild mental retardation aged 23.3±2.1 years (four masters of sport and four candidates for master of sport) specializing in short-distance running took part in the scientific study. The study was conducted using the ST-150 stabilometric platform with STPL software. A two-phase Romberg test was performed during four periods of the annual sports training cycle. Friedman's test and Nemenski's post-hoc analysis were used to assess the reliability of the differences between the results.

Results and conclusions. In the surveyed track and field athletes with mental retardation, statokinetic stability remained at a stable and optimal level throughout the annual sports training cycle. During the competitive period, the athletes showed better coordination of the visual, proprioceptive, and vestibular analyzers, as evidenced by the lower value of the center of pressure displacement velocity. During the special preparatory and transitional periods, an increased role of vision in maintaining statokinetic stability was identified. According to the post-hoc analysis by Nemeni (p-value < 0.05, Friedman test), significant differences were found in the parameters of the sagittal axis X and the speed of movement of the center of pressure. High activity of the systems in maintaining stability in the basic stance was observed in the competitive and transition periods, as evidenced by the energy expenditure coefficient.

Keywords: *stabilometry, sports for people with mental retardation, athletics, annual cycle.*

Introduction. Studying the patterns of the body's adaptation to muscular (athletic) activity is an important task in sports physiology [11, 14]. Haghighi A.H. et.al. identify the following responses to physical exertion: adaptation of the neuromuscular apparatus (NMA), changes in the athlete's sensorimotor reactions [12], plastic functional reorganization of the NMA [6], changes in the neural structures of motor control [10], and statokinetic stability [3]. The degree of involvement of each sensory system in movement control changes as motor skills improve and depending on the tasks to be performed in different conditions of maintaining body balance [4, 8, 13].

Skilled athletes constantly improve their statokinetic stability, on which the precise execution of motor actions depends. A considerable number of studies have been devoted to the study of athletes' statokinetic stability using stabilometry. Thus, Zaicev A. and co-authors [15] found that the length and area of the statokinesiogram in athletes during the competitive period are greater than in the preparatory period, which reflects a decrease in functional capabilities.

A.S. Nazarenko and F.A. Mavliev [5] note that the sensitivity of afferent systems increases under the influence of sports activities. It has been shown that the dynamics of the average parameters of statokinetic stability reflect a higher level of long-term adaptation in athletes of situational sports than in athletes of cyclic sports [5]. In track and field athletes with mental retardation, due to the presence of organic lesions of the central nervous system, statokinetic stability integrally shows the coordination of the interaction between visual and proprioceptive analyzers [1, 2].

In highly skilled track and field athletes with mental retardation, the determination of statokinetic stability will make it possible to judge the coordination of analyzers in maintaining postural stability, and changes in it over the annual cycle will reflect the characteristics of the state of coordination function under the influence of the volume and intensity of the load. The study of individual and average stabilometric indicators of athletes obtained at different periods of the annual cycle will allow us to establish the influence of the specifics of sports activities on the statokinetic stability of athletes.

Objective of the study is to assess the statokinetic stability of athletes with mental retardation in a year-long sports training cycle using stabilometry.

Methods and structure of the study. 8 men with mild mental retardation aged 23.3±2.1 years participated in the study. Sports qualifications: four masters of sport, four candidates for master of sport. Specialization: athletics, short-distance running. The study was conducted using the ST-150 stabilometric platform with STPL software. In four periods of the annual sports training cycle (general preparation – GP, special preparation – SP, competition – CP, transition – TP), a two-phase Romberg test was performed in the basic heel-together, toes-apart stance (first phase with eyes open, second phase with eyes closed) with subsequent signal filtering (cut-off frequency 7 Hz). The parameters of the trajectory of the total center of pressure on the platform plane were recorded. Additionally, the energy expenditure coefficient and Romberg coefficient were calculated. To assess the reliability of the differences between the results in different periods, Friedman's test (due to the absence of normal distribution) and Nemeni's post-hoc analysis were used.

Results of the study and discussion. Based on the study of statokinesiogram parameters in the open-eye test: the speed of movement of the center of pressure (V, mm/s), the length (L, mm) and area (S, mm) of the statokinesiogram, the coordinates on the X-axis (mm), coordinates on the Y-axis (mm), the stable and optimal statokinetic stability of athletes with mental retardation was determined in the studied periods of the annual sports training cycle (Table 1).

In the open-eye test, the initial level of statokinetic stability in GP showed that all parameters studied: the speed of movement of the center of pressure, the length and area of the statokinesiogram, and the coordinates on the X and Y axes were at an optimal level. Compared to GP, in the other periods there was a decrease in the speed of the center of pressure, length and area of the statokinesiogram. This indicates sufficient physical performance and coordination in the work of the visual, proprioceptive and vestibular analyzers. According to the post-hoc analysis by Nemeni (p-value < 0.05, Friedman test), significant differences were found in the parameters of the sagittal X-axis and the speed of movement of the center of pressure V (Fig. 1). Thus, in the open-eye test, there was a significant difference between GP and SP on the X axis and between SP and CP on the speed of movement of the center of pressure. The maximum degree of coordination of the analyzers in maintaining stability was observed in CP.

When comparing the results of the statokinesiogram in tests with open and closed eyes, the following patterns were identified. An increase in the speed of movement of the center of pressure, length and area of the statokinesiogram in GP and TP in the test with closed eyes. The shifts obtained were insignificant and reflected the influence of proprioception on the body's ability to maintain an upright posture. The indicators of the speed of movement of the center of pressure,

Table 1. Results of stabilometric testing of track and field athletes with mental retardation at different periods of the annual cycle (n=8)

Period	Eyes	V, mm/s	L, mm	S, mm	X, mm	Y, mm
GP	Opened	9,18±2,08	275,53±62,31	132,86±32,90	3,79±1,66	8,05±6,02
	Closed	11,68±1,77	350,64±52,86	159,93±35,01	1,25±1,86	6,00±5,89
SP	Opened	7,01±0,90	209,46±26,82	99,24±39,06	-2,23±1,35	10,59±6,54
	Closed	11,61±1,64	348,13±49,31	259,03±70,18	-0,31±1,61	13,01±6,24
CP	Opened	6,64±0,82	199,64±24,45	73,84±12,98	-0,14±3,52	6,68±5,38
	Closed	10,41±1,67	313,14±50,03	152,20±36,03	1,21±3,68	9,66±6,81
TP	Opened	7,64±1,07	229,30±32,14	66,30±11,92	-0,50±1,95	-1,98±3,77
	Closed	11,65±1,88	349,98±56,30	216,14±45,84	1,06±1,74	0,90±4,03

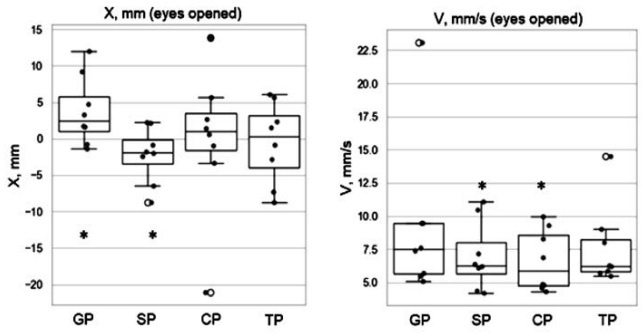

Fig. 1. Distribution of these parameters by period with confidence intervals (post-hoc analysis by Nemeni (– p-value < 0.05, Friedman test)*

length and area of the statokinesiogram in SP and CP increased by more than 60%.

The changes identified may be associated with an increase in the volume and intensity of physical activity and a significant contribution of the visual analyzer to maintaining stability. The results obtained indicate the prevalence of visual control in maintaining statokinetic balance and the absence of signs of physical fatigue.

A.B. Trembach et al. [9] showed in their work that one of the objective markers of physical fatigue is an increase in the speed of movement of the center of pressure. In their opinion, physical fatigue and psycho-emotional stress can be factors in the disruption of the functioning of the central nervous system. Analyzing the energy expenditure coefficient, we found that the greatest activity in maintaining balance in the basic stance was observed in CP and TP (Table 2). The Romberg coefficient indicated the significant role of the visual analyzer in SP and TP.

Table 2. Stabilometric coefficients in different periods of the annual cycle (u.e.)

Period	Energy consumption coefficient	Romberg's coefficient
GP	193,50±37,32	141,25±29,39
SP	187,13±3,41	314,75±85,58
CP	233,50±39,82	198,63±30,90
TP	222,13±45,17	337,50±74,09

During the remaining periods of the annual training cycle, highly skilled track and field athletes demonstrated optimal statokinetic stability. The results obtained are consistent with the data reported by Nopin S.V. et al. [7].

Conclusions. Thus, in track and field athletes with intellectual disabilities, statokinetic stability was at an optimal level during all periods of the annual training cycle. During the competitive period, track and field athletes showed coordination in the work of the visual, proprioceptive and vestibular analysers and interaction between different levels of the central nervous system. During the special preparatory and transitional periods, an increased role of vision in maintaining statokinetic stability was identified.

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Research into psychomotor differences in adolescents with childhood cerebral palsy who participate in adaptive sports and those who do not

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Abstract

Objective of the study is to identify the characteristics of psychomotor development in adolescents with cerebral palsy who participate and do not participate in adaptive sports.

Methods and structure of the study. 20 adolescents aged 12-14 with cerebral palsy (10 sledge hockey players from the CSKA team and 10 students from Boarding School No. 17, Moscow) participated in the scientific study conducted in November 2024. All respondents had been diagnosed with spastic diplegia and had normal intellectual abilities. To assess the level of psychomotor development in adolescents with cerebral palsy who participate in sports and those who do not, the following indicators were studied: reaction time to light, reaction time to sound, reaction time to choice, duration of an individual minute, and the tapping test. The PsychoTest hardware and software complex was used.

Results and conclusions. It has been found that sledge hockey has a positive effect on the psychomotor development of adolescents with cerebral palsy, contributing to improved psycho-emotional health. Athletes with cerebral palsy have a higher level of ability to regulate their actions based on the information they receive and their concentration compared to their peers, the productive quality of their nervous system is higher, and their psychological state is much closer to that of their typical peers.

Keywords: *psychomotor skills, cerebral palsy, adaptive sports, tepping test, practising and non-practising adolescents, sledge hockey.*

Introduction. Recently, specialists have noted a significant increase in interest in studying the motor condition of children and adolescents with cerebral palsy (CP). This is due, on the one hand, to the fact that the percentage of children with this pathology is increasing year by year, and on the other hand, to the expansion of the search for opportunities for their rehabilitation, including the use of adaptive sports [2].

The motor function of adolescents with CP can vary significantly depending on the severity of the disease, the presence of concomitant disorders and, as recent studies have shown, participation in sports activities. In this regard, studies of the psychomotor development of young Paralympians deserve special attention.

One of the most popular types of adaptive sports is sledge hockey, a Paralympic version of classic hockey that appeared in Russia in the 2000s. This sport is included in the program of the Winter Paralympic Games [6].

A necessary condition for effective performance in sledge hockey is not only physical, technical and tactical readiness, but also psychological readiness of the athlete [7].

An objective and accurate assessment of the key psychomotor development indicators for sledge hockey players is one of the aspects of competently designing a training program and monitoring the condition of those involved [6].

Studying the psychomotor development of adolescents with cerebral palsy can reveal the specific characteristics of each individual, allowing for the development of more effective and personalized programs for subsequent stages of rehabilitation [3].

In this regard, a study was conducted to diagnose and compare the main indicators of psychomotor development in adolescents with CP who participate and do not participate in adaptive sports.

Objective of the study is to identify the characteristics of psychomotor development in adolescents with cerebral palsy who participate and do not participate in adaptive sports.

Methods and structure of the study. 20 adolescents aged 12-14 with cerebral palsy (10 sledge hockey players from the CSKA team and 10 students from Boarding School No. 17, Moscow) participated in the scientific study conducted in November 2024. All respondents had been diagnosed with spastic diplegia and had normal intellectual abilities.

To assess the level of psychomotor development in adolescents with cerebral palsy who participate in sports and those who do not, the following indicators were studied: reaction time to light, reaction time to sound, reaction time to choice, duration of an individual minute, and the tapping test. The PsychoTest hardware and software complex was used.

Results of the study and discussion. The following results were obtained during the scientific work (Table 1).

The results of the 'Individual Minute' test showed that young athletes with cerebral palsy are on average 32.8% more accurate in determining this time parameter. As is well known, this technique is used in working with athletes to assess their psychological state, which can indicate a good state of concentration, combat readiness, or increased anxiety, restlessness, depression, excessive relaxation, or lack of focus. The fact that adolescents with cerebral palsy exceeded 1 minute in this test may indicate an overly relaxed state, when time passes very slowly. However, young sledge hockey players are much closer to the norm in this parameter compared to non-athletes with similar nosology.

Measuring the time of motor responses is one of the most convenient and widely used methods for studying the dynamics of nervous processes in general, and is widely used in the physiology of higher nervous activity in humans [1].

The most pronounced difference in the psychomotor indicators of young sledge hockey players and their peers who do not play sports was found in the results of RMO measurements. It was found that the RMO indicator in young sledge hockey players is 372.61 ms lower than in non-athletes, and the results themselves differ by 61.3%.

The speed of motor reaction is of great practical importance for virtually any professional activity involving the performance of any motor actions [4].

The speed of a person's reaction to different stimuli varies. However, reaction time may vary depending on individual characteristics (fatigue, nervous system characteristics, emotional and mental characteristics), sound intensity, and other factors.

Our study found that adolescents with cerebral palsy who play sledge hockey have shorter motor reaction times to sound and light than their peers with the same diagnosis who do not play sports. The results of reaction times to sound differ by 16.7%, and to light

Table Results of psychomotor testing in adolescents with cerebral palsy who play sledge hockey

Test indicators	Statistical indicators	Group of respondents		Δ, %
		Participate (n=10)	Do not participate (n=10)	
Reaction time to light, ms	Ẍ±m	380,00	456,24	16,7
		42,03	51,09	
Reaction time to sound, ms	Ẍ±m	438,05	544,72	19,6
		24,92	53,28	
Reactions to a moving object (RMO), ms	Ẍ±m	234,95	607,56	61,3
		44,32	185,47	
Reaction time to choice, ms	Ẍ±m	575,85	779,88	26,2
		34,56	51,64	
Individual minute error, s	Ẍ±m	16,60	24,70	32,8
		6,67	7,06	
Tapping test, number of movements	Ẍ±m	38,50	39,62	-2,8
		4,90	2,81	

by 19.6%. At the same time, it was found that adolescents with CP reacted faster to light than to sound, which contradicts the data obtained in a study of normotypical adolescents (it is indicated that they react faster to sound than to light).

The reaction time for making a choice increases in comparison with the time for a simple motor reaction to light and sound due to the appearance of an additional information processing stage. This stage is mainly associated with the processes of recognition and classification of a stimulus into a specific group or category. Nevertheless, young sledge hockey players have a choice time that is more than 200 ms (26.2%) shorter than that of their peers with the same nosology who do not participate in sports. This parameter is believed to be related to cognitive processes [4, 8].

The tapping test allows you to assess the maximum speed of hand movements and identify shifts in the central nervous system, rather than in the muscles [5]. It is known that a normal child over 10 years of age, like an adult, should normally score at least 50 points in 10 seconds. A result of 40-49 dots in 10 seconds indicates minor motor problems. If the result is below 40, there are obvious motor problems.

In our study, the results of adolescents with cerebral palsy who participate in sports and those who do not were identical, at 38.50 and 39.62 movements in 10 seconds, respectively. Indeed, adolescents with cerebral palsy have serious motor problems due to their central nervous system (CNS) disease. Sports training in sledge hockey, aimed at improving physical, technical, tactical and mental preparedness, does not affect the deep processes in the CNS.

Conclusions. Thus, the study of psychomotor indicators in adolescents with cerebral palsy who participate and do not participate in sports showed that sled hockey has a positive effect on some important parameters of psychomotor development.

It was found that athletes with CP have a higher level of ability to regulate their actions based on the information they receive compared to their peers who do not participate in sports. In addition, the productive quality of the nervous system of young sledge hockey players, judging by the results of simple motor reactions to light and sound, is higher than that of their peers with cerebral palsy who do not participate in sports.

Judging by the results of the 'Individual Minute' test, young sledge hockey players are much closer in their psychological state to their normotypical peers and have a higher level of concentration compared to non-athletes with similar nosology.

Based on the study, it can be concluded that sledge hockey has a positive effect on the psychomotor development of adolescents with cerebral palsy, contributing to the improvement of their psycho-emotional health.

For a more detailed study of adaptation resources, it is necessary to conduct a wide range of comprehensive testing of various aspects of the preparedness of athletes with cerebral palsy.

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The formation of components of a healthy lifestyle and functional state of students majoring in education

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Abstract

Objective of the study is to compare the formation of healthy lifestyle components and the functional state of systems in students of pedagogical specialization with different levels of physical activity.

Methods and structure of the study. A total of 101 1st-year students from Vyatka State University in Kirov participated in the research project, studying life safety, physical education and foreign languages. A comparative analysis of the components of a healthy lifestyle was conducted between the groups using the ProZOZh questionnaire and indicators of the functional state of the body, characterized by vital lung capacity, hand dynamometry, the functional state of the cardiovascular system and its adaptation to physical exertion. The reliability of the differences was determined using the non-parametric Mann-Whitney criterion. Statistical analysis of the data was performed using the Jamovi program (Version 1.6).

Results and conclusions. The data obtained indicate a satisfactory level of healthy lifestyle components among 1st-year students with different levels of physical activity. High scores were found for internal growth and interpersonal relationships, while attitudes towards health and proper nutrition were rated lower. Statistically significant differences between the groups were found in physical activity, internal growth and interpersonal relationships, with the group studying life safety and physical education showing significantly higher values compared to those studying foreign languages. Assessment of the functional state of students in the study groups revealed higher statistically significant indicators in boys and girls in the life safety and physical education group in terms of hand dynamometer development, cardiovascular system response to physical activity, and adaptation to it. Thus, a healthy lifestyle and physical activity contribute to the preservation of physical health and emotional well-being of students.

Keywords: *healthy lifestyle, physical activity, signs, functional state, students.*

Introduction. The problem of insufficient attention paid by students of pedagogical disciplines to maintaining and strengthening their health is particularly relevant today, as it has a further impact on the results of a teacher's professional activity. The most important condition for maintaining health is adherence to the principles of a healthy lifestyle, including physical culture (physical activity) as the leading preventive factor for cardiovascular diseases [2, 4]. According to WHO data, 27.5% of adults and 81% of adolescents do not follow recommendations for physical activity due to prolonged use of social media, physical inactivity during school hours, and failure to follow hygiene requirements in their daily routine, which ultimately leads to a deterioration in their overall health, a reduction in their adaptive resources, negative consequences, and disease [3]. Thus, insufficient attention to health and its preservation leads to a decline in quality of life, which subsequently affects the effectiveness of teachers' work and requires further study.

Objective of the study is to compare the formation of healthy lifestyle components and the functional state of systems in students of pedagogical specialization with different levels of physical activity.

Methods and structure of the study. First-year students majoring in education at Vyatka State University (VSU) in Kirov (n=101) participated in the study. A comparative analysis was conducted between students with different levels of physical activity studying life safety and physical education (group 1) and foreign languages (group 2). To assess the components of a healthy lifestyle (HL), we used the 'Healthy Life-

style Profile' ('Pro HL') questionnaire, which includes questions-statements distributed across six scales [7]. We measured vital lung capacity (VLC, ml) and muscle strength of the dominant hand (MS, kg) using standard methods and calculated the indices (VC, ml/kg and SI, %). The functional state of the cardiovascular system (CVS) was determined by the body's response (%) and the time it took to restore the heart rate (HR, s) to a measured physical load (Martine test). To assess the degree of adaptation of the circulatory system, the adaptive potential (AP) was calculated using the formula of R.M. Baevsky [1]. To prove reliable differences in the severity of healthy lifestyle indicators and functional indicators between groups, the non-parametric Mann-Whitney criterion was used. Statistical analysis of the data was performed using the Jamovi program (Version 1.6).

Results of the study and discussion. The data obtained indicate a satisfactory level of healthy lifestyle components among students in groups 1 and 2 (Table 1).

A comparative analysis of healthy lifestyle indicators among the study groups with different levels of physical activity revealed high ratings for internal growth and interpersonal relationships, indicating a positive atmosphere within the groups and student satisfaction with opportunities for development. Responsibility for health, nutrition and stress management are generally rated lower by students, which highlights the need for more effective inclusion of health maintenance and stress reduction programs (Table 1). At the same time, in group 2, the mean and median values for health responsibility and stress management are slightly higher, which may be due to more active health care and better stress management skills. The assessment of healthy lifestyle components showed statistically significant differences between the groups in terms of physical activity ($U = 581$, $p < 0.001$), internal growth ($U = 982$, $p < 0.05$) and interpersonal relationships ($U = 977$, $p < 0.05$). At the same time, the values in the group of students majoring in life safety and physical education were significantly higher. The standard deviations in the group of students majoring in foreign languages are higher according to these indicators, which indicates a greater diversity of opinions on these issues. The groups do not differ significantly in terms of responsibility for health, nutrition, and stress management ($p > 0.05$). The results of our research are partially consistent with the data of V.P. Maltsev et al. [5].

The results of the study showed statistically significant differences in most of the functional indicators studied between groups 1 and 2 (Table 2). Significant differences were found among boys in groups 1 and 2 in terms of VI, SI, Martine test, and AP indicators; in groups 1 and 2 of girls – in terms of VI, SI, Martine test, AP indicators, and recovery time after exercise.

The results obtained in boys and girls with greater motor activity show higher development of respiratory muscles, development of hand muscle strength, and adaptation of the cardiovascular system to physical exertion. It was found that the average SI values for boys and girls in group 1 were higher than those for boys and girls in group 2 by 18.85% and 11.22%, respectively ($p < 0.01$). A decrease in hand dynamometer values indirectly indicates a decrease in muscle strength throughout the body.

Table 1. Descriptive statistics of healthy lifestyle indicators in the compared groups

Healthy lifestyle indicators	Group	Average	SD	Median	95% confidence interval		Shapiro–Wilk	
					Lower	Upper	W	p
Responsibility for health	1	2,21	0,60	2,11	2,04	2,37	0,92	0,002
	2	2,25	0,52	2,33	2,10	2,39	0,95	0,045
Physical activity	1	2,86	0,52	2,88	2,71	3,00	0,94	0,012
	2	2,19	0,65	2,13	2,01	2,37	0,95	0,023
Nutrition	1	2,31	0,46	2,22	2,18	2,44	0,96	0,106
	2	2,30	0,47	2,22	2,17	2,43	0,97	0,28
Personal growth	1	3,27	0,41	3,33	3,16	3,38	0,96	0,09
	2	3,05	0,55	3,00	2,90	3,21	0,96	0,079
Interpersonal relationships	1	3,48	0,46	3,67	3,36	3,61	0,88	0,001
	2	3,29	0,52	3,44	3,15	3,43	0,94	0,016
Stress management	1	2,42	0,61	2,38	2,25	2,58	0,98	0,561
	2	2,51	0,55	2,50	2,36	2,66	0,97	0,202

Note: SD – standard deviation.

Таблица 2. Средние значения функциональных показателей юношей и девушек в сравниваемых группах

Indicators	1 group (n=24) M±m	2 group (n=20) M±m	p	1 group (n=26) M±m	2 group (n=31) M±m	p
	Boys			Girls		
Strength index (SI, %)	65,34±2,26	46,49±1,62	<0,01	47,07±1,99	35,85±1,57	<0,01
Vitality index (VI, ml/kg)	60,55±0,85	50,38±1,69	<0,01	50,55±0,55	49,72±1,68	>0,05
Recovery time (s)	75,0±3,12	83,15±7,57	>0,05	66,15±0,97	90,0±4,84	<0,01
Reaction to load (Martine test, %)	33,3±2,57	40,25±3,14	<0,01	31,46±2,01	48,56±2,81	<0,01
Adaptation potential, units	1,72±0,10	2,37±0,11	<0,01	2,10±0,03	2,44±0,08	<0,01

Note: p – statistically significant differences.

The VI values in boys in group 1 are 10.17% higher than in boys in group 2 ($p < 0.01$). At the same time, the time required for VI recovery after a measured physical load in girls differed by an average of 23.85 s ($p < 0.01$), which indicates a decrease in the reserve capacity of the cardiovascular system in group 2. This indicator shows a favorable response to the load in both groups, among both boys and girls.

At the same time, the slower the heart rate recovers after moderate physical activity, the lower the functional state of the CVS and the higher the stress on the regulatory systems. Reaction to load to physical exercise (Matine test) in boys and girls in group 1 is on average 6.95% and 17.1% lower than in boys and girls in group 2 ($p < 0.01$), which is associated with the systematic physical activity of students majoring in life safety and physical education.

AP CVS showed satisfactory adaptation to physical exertion in students in group 1 and strain on adaptation mechanisms in students in group 2 ($p<0.01$). Data [6] confirm the results of our studies.

Conclusions. The studies conducted showed a satisfactory level of development of healthy lifestyle components. Students with increased physical activity have better communication skills, a greater desire to work in a team, higher social activity, and a desire for self-improvement. The development of respiratory and hand muscles and the adaptive capacity of the cardiovascular system to physical exertion are better developed in students with higher motor activity, which contributes to maintaining health and is a guarantee of successful professional activity.

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Functional control in physical education of medical students

UDC 796

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Abstract

Objective of the study is to theoretically substantiate and develop operational functional monitoring of the physical condition of medical university students based on their heart rate in a standing position (at rest), which will allow for a differentiated approach to regulating students' physical activity during physical education.

Methods and structure of the study. The study was conducted from 2024 to 2025 at the Krasnoyarsk State Medical University. The sample size was 800 1st-2nd year students. The following research methods were selected to collect scientific data: analysis of scientific and methodological literature, questionnaires, physical fitness testing, pedagogical observation, surveys, measurement of heart rate while standing during practical classes and in general over the course of a year, mathematical statistics, etc.

The collected and systematised scientific and practical material contributed to the development of levels of functional readiness of medical university students based on heart rate in a standing position (at rest), which allows for the rapid monitoring and regulation of students' physical activity during physical education.

Results and conclusions. Based on the results of scientific and practical work, levels of functional readiness (high, medium, and low) of students for physical activity were developed based on monitoring heart rate in a standing position (at rest). This functional monitoring allows for the rapid assessment of students' psychophysical condition during physical education classes and timely adjustments to the teaching process. All this contributes to a differentiated approach to students' physical activity depending on their initial functional condition and timely adjustment of the physical condition of those involved in physical education.

Keywords: *functional control, physical education, medical university, students, heart rate, differentiated approach, levels.*

Introduction. Physical education for students is of great importance in the overall structure of professional education. The modern educational process in higher education is quite multifaceted, intensive and places high psychophysical demands on the mental and physical working capacity of students. In the educational process, professional competencies are effectively developed in students with an adequate level of physical fitness, which is formed in physical education classes at the university. At the same time, as shown by theoretical and practical analysis of the physical fitness of modern students, the following unfavourable trends in physical fitness indicators are noted: more than 50% of young men and 70% of young women have low physical fitness results; systematically engage in physical culture and sports (at least 3 times a week) 15% of young men and 7% of young women. Up to 70% or more of their total time is spent by modern youth on various electronic devices and gadgets, which leads to low physical activity, overloading of visual analysers, various psychological stresses, etc., which in general has a negative impact on the overall psychophysical state of modern students. All this generally prevents students from performing the necessary physical activity in physical education classes and, accordingly, from developing the necessary physical fitness. Particular attention should be paid to

medical university students, who, due to their specialised medical training, undergo a fairly intensive and lengthy educational process, leading to various mental and psychological stresses. All this leads to the fact that in physical education classes, medical university students experience psychophysical inconsistency, unwillingness to perform physical exercises, and low motor motivation. In this regard, it is important to assess the initial psychophysical readiness of medical university students to perform physical activities and their emotional readiness for motor recreation. To quickly determine the level of students' readiness for classes, functional monitoring of heart rate is proposed, which will allow for a selective and differentiated approach to the pedagogical process of physical education of young people in accordance with their functional and emotional readiness. This work is presented in this direction.

Objective of the study is to theoretically substantiate and develop operational functional monitoring of the physical condition of medical university students based on their heart rate in a standing position (at rest), which will allow for a differentiated approach to regulating students' physical activity during physical education.

Methods and structure of the study. Methods and structure of the study. The study was conducted from 2024 to 2025 at the Krasnoyarsk State Medical University. The sample size was 800 1st-2nd year students. The following research methods were selected to collect scientific data: analysis of scientific and methodological literature, questionnaires, physical fitness testing, pedagogical observation, surveys, measurement of heart rate while standing during practical classes and in general over the course of a year, mathematical statistics, etc.

The collected and systematised scientific and practical material contributed to the development of levels of functional readiness of medical university students based on heart rate in a standing position (at rest), which allows for the rapid monitoring and regulation of students' physical activity during physical education.

Results of the study and discussion. Upon completion of the work, levels of functional readiness of students for physical education classes were developed based on operational monitoring of heart rate in a standing position (at rest).

This was based on statistical data that included more than 2,000 measurements of heart rate in a standing position (at rest) per minute. Measurements were taken from students throughout the academic year during physical education classes. The statistical data collected contributed to the development of functional status levels: high, medium, low. Calculations were made based on the average group values of the sample, and then the functional levels were calculated according to the sigma deviations – ($\bar{X} \pm \sigma$) Table 1.

Table 1 – Levels of functional readiness of students based on heart rate in a standing position (at rest) per minute

Heart rate while standing (at rest) per minute	Functional readiness levels
75 – 80 bpm	High
82 – 90 bpm	Medium
93 – 110 > bpm	Low

Table 2 – Content of practical classes for students with different levels of functional readiness.

Functional readiness levels	Content of practical training sessions	Permissible HR (heart rate)
High	Walking, running exercises, general developmental exercises, strength and speed-strength exercises, agility and coordination exercises, sports games, athletics exercises, etc. 80% of exercises are dynamic and 20% are performed in a standing or sitting position.	130 – 180 bpm
Medium	Walking, running exercises, general developmental exercises, strength training, developing mobility of the musculoskeletal system, playful exercises. 50% of exercises are dynamic and 50% are performed in a standing or sitting position	120 – 160 bpm
Low	Walking, measured running exercises, development of musculoskeletal mobility, general developmental exercises, exercises in pairs, at the wall bars, various exercises with objects (gymnastic stick, ball, etc.). 85% of the exercises are performed in a standing and sitting position and 15% in a dynamic position.	120 – 140 > bpm

Based on operational monitoring of students' functional condition before the start of physical education classes, the teacher distributes students into groups according to their initial level of functional readiness: high, medium and low. In accordance with the level of functional readiness, the teacher organises the physical education process in groups in a differentiated manner.

Table 2 shows the content of practical physical education classes for students with different levels of functional readiness (high, medium and low).

Table 2 presents a set of physical exercises for students depending on their functional readiness, as well as the acceptable heart rate during these classes and the percentage ratio of dynamic and static exercises.

Conclusions. The levels of functional readiness of students in medical universities, developed on the basis of heart rate in a standing position (at rest), contribute to the operational control and management of the physical condition of students, a differentiated approach to regulating physical activity in classes, and a more effective and progressive formation of the proper physical fitness of future doctors. These scientific and methodological developments can be recommended for students at other universities in the country.

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Sociological analysis of psychophysical readiness of students of the social and legal institute for future professional activities

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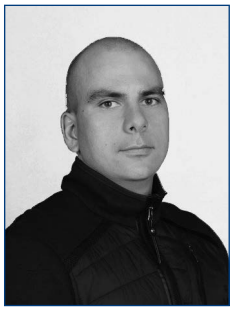

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Abstract

Objective of the study is to substantiate and develop a sociological questionnaire for analyzing the psychophysical readiness of students for future professional activity; to identify students' readiness for active work in the profession, based on the analytical material obtained.

Methods and structure of the study. A sociological analysis based on a questionnaire survey was conducted in 2024 among 2nd-3rd year students of the Social and Legal Institute of Siberian Federal University in Krasnoyarsk. The sample size was 70 people. A questionnaire was developed in advance, including 9 questions related to the analysis of students' psychophysical readiness for future professional activity. The developed sociological questionnaire was presented to students, who gave their written answers to the questions, on the basis of which a theoretical analysis of the psychophysical readiness of young people for active labor activity was carried out.

Results and conclusions. The conducted sociological analysis revealed students' attitudes toward the need to develop psychophysical readiness for future professional activity; their understanding of the concept of 'psychophysical readiness'; the means and forms of developing psychophysical readiness identified by respondents; the general readiness of students for systematic physical education and sports activities to maintain psychophysical potential in the process of life.

Keywords: *sociological analysis, psychophysical readiness, students, professional activity, survey.*

Introduction. The modern process of forming the professional education of future specialists includes two basic tasks: the formation of solid, professionally significant competencies in the chosen field of work and the psychophysical readiness of young people to maintain the necessary rhythm and performance in their future professional activities. In this regard, proper physical and mental readiness, which is developed through educational and practical classes in the discipline 'Physical Culture and Sports' at the university, is of particular importance in the professional training of young students.

This theoretical position determined the objective of this work, which is aimed at analysing the psychophysical readiness of senior students for active labour activity in their future profession and making appropriate methodological adjustments to the process of applied physical education of young students at the university.

Objective of the study is to substantiate and develop a sociological questionnaire for analyzing the psychophysical readiness of students for future professional activity; to identify students' readiness for active work in the profession, based on the analytical material obtained.

Methods and structure of the study. A sociological analysis based on a questionnaire survey was conducted in 2024 among 2nd-3rd year students of the Social and Legal Institute of Siberian Federal University in Krasnoyarsk. The sample size was 70 people. A questionnaire was developed in advance, including 9 questions related to the analysis of students' psychophysical readiness for future professional activity. The developed sociological questionnaire was presented

to students, who gave their written answers to the questions, on the basis of which a theoretical analysis of the psychophysical readiness of young people for active labor activity was carried out.

Results of the study and discussion. Upon completion of the sociological analysis based on the developed questionnaire, which included 9 key questions to be answered by respondents, theoretical conclusions were formulated to determine the psychophysical readiness of students of the social and legal institute for their future professional activities.

In our article, we adhere to the following definition: 'psychophysical readiness of students' is a state characterised by the formation of psychophysical potential for the effective and sustained performance of a specific professional activity.

Analysis of the results of a survey of 2nd-3rd year students majoring in social sciences and law led to the following analytical conclusions: more than 60% of respondents do not have a clear understanding of what 'psychophysical readiness' is; 42% of respondents believe that there is no need to develop and main-

Table 1. Results of a survey of social and legal students on their psychological and physical readiness for future professional activity

No.	Questionnaire questions	Respondents' answers in %
1	2	3
1.	**Psychophysical readiness is:** - developed physical qualities; - physical activity; - healthy lifestyle.	 24% 46% 64%
2.	**Psychophysical readiness is necessary in the future profession:** - not necessary; - it is necessary to maintain psychophysical readiness; - psychophysical readiness developed at the university is sufficient.	 24% 58% 18%
3.	**Physical education and sports were cultivated in the family:** - no; - parents sent children to sports clubs.	 42% 36%
4.	**Participate in physical education and sports:** - yes, participate; - continue to study at the present time; - no, they did not.	 56% 18% 24%
5.	**The most popular sports among respondents**: - athletics; - sports games; - swimming; - sports dancing.	 8% 10% 8% 8%
6.	**What physical qualities do you need in your future profession:** - agility and coordination; - speed; - general endurance; - all physical qualities are important.	 34% 18% 44% 34%
7.	**What psychological qualities are necessary for your future profession:** - assertiveness; - conviction; - composure.	 62% 60% 82%
8.	**What psychophysical qualities do you need to improve for your future professional activity:** - physical qualities; - psychological qualities.	 92% 96%
9.	**What physical activities do you prefer when developing mental and physical readiness:** - sports games; - martial arts; - athletic gymnastics.	 8% 12% 88%

tain psychophysical readiness; 42% of respondents did not participate in physical education and sports in their families; only 18% systematically engage in physical education and sports; 44% believe that general endurance will be an important physical quality in their future profession, and 34% of students indicated that all physical qualities are important; 82% of respondents identified 'composure' as an important psychological quality in their future chosen profession, 62% identified assertiveness, and 60% identified conviction. In addition, 92% of respondents believe it is necessary to develop professional and practical physical qualities more consistently, and 96% believe the same about psychological qualities. 88% believe that athletic gymnastics is the basic means of developing psychophysical readiness.

All this allows us to conclude that students have acquired certain theoretical and practical knowledge and skills for developing psychophysical readiness at the university. At the same time, sociological analysis has shown what adjustments teachers need to make to the content of students' psychophysical training in the process of physical education at university.

Conclusions. The analysis of the psychophysical readiness of students at the Social and Legal Institute, based on a questionnaire survey, made it possible to form a 'profile of students' psychophysical readiness,' which includes the definition of psychophysical readiness, which respondents understand as a healthy lifestyle (64%); 42% of respondents believe that there is no need for psychophysical readiness in their future profession; 42% have not been systematically involved in physical education and sports; 44% of respondents believe that general endurance is the leading physical quality in psychophysical readiness; 82% of students consider composure to be an important psychological quality in their future profession; 88% of respondents identify athletic gymnastics as the main means of developing psychophysical readiness.

Thus, in general, students have a common understanding of psychophysical readiness and are aware of the need to develop psychophysical readiness for their future professional activities. At the same time, the results of the questionnaire show specialists and teachers what they need to pay attention to when developing the proper psychophysical readiness of students in educational and practical physical education classes at the university.

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Digitalization as a factor of increasing the motivation of university students in China to physical education on the example of tennis

UDC 796

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Abstract

Objective of the study is to investigate ways of implementing and evaluating the effectiveness of university physical education within the framework of digital sports, both from the point of view of building a theoretical basis and from the point of view of practical research.

Methods and structure of the study. A total of 64 students aged 18–20 were divided into experimental and control groups, each subjected to different teaching methods for comparison.

Results and conclusions. Pre-test results showed that all 12 items had p-values greater than 0.05 ($p>0.05$), indicating no significant differences between the experimental (EG) and control groups (CON) prior to the intervention. Post-test results revealed that all p-values were below 0.05 or 0.01, demonstrating that the experimental group scored significantly higher than the control group across all dimensions of intrinsic motivation. The experimental teaching method (incorporating VR, intelligent systems, and online interaction) significantly enhanced students' intrinsic motivation, whereas the traditional approach failed to maintain or improve motivation levels, even showing slight declines.

Keywords: *Digital sports, motivation for physical education, tennis teaching, gamification in learning.*

Introduction. To implement the Outline for Building a Strong Education Nation (2024–2035), digital transformation in education has become a crucial breakthrough in advancing educational modernization. Educational institutions are leveraging pilot programs to develop personalized resources, aiming to bridge the gap between equity and quality while reshaping teaching methodologies and talent development paradigms [1]. With the rapid advancement of digital technologies such as sensor technology and virtual reality (VR), their innovative applications in physical education have significantly enhanced teaching efficiency and learning experiences, providing technological support for the transformation of traditional educational models [2].

Smart sports equipment, powered by sensor technology, enables real-time monitoring of students' physical activity—such as heart rate and gait frequency—providing educators with accurate data to assess students' physical conditions and offer personalized exercise recommendations. For instance, smart running shoes equipped with sensors can analyze a runner's posture and foot strike, delivering precise training guidance for coaches and athletes.

Virtual reality (VR) breaks through spatial and temporal constraints, allowing students to experience high-barrier sports like skiing and golf in the classroom through head-mounted displays, enhancing learning flexibility and convenience. Supplemented with multimedia resources such as animations and interactive games, abstract movements are visualized, stimulating interest while supporting self-directed learning beyond the classroom [3].

Data platforms further bridge the two-way channel between "teaching" and "learning." Teachers dynamically adjust instructional strategies based on real-time analytics, while students tailor training plans according to personal data, achieving self-monitoring and goal management. Consequently, physical education is shifting from experience-driven to data-driven approaches, with scientific, personalized, and high-efficiency practices becoming the new benchmarks.

In parallel to technological advancements, research on learning motivation provides empirical support for innovative teaching methods. Multiple studies have demonstrated the positive impact of gamification design on short-term learning engagement. From the students' perspective, external gamification enhances motivation by fostering a determination to play games and a voluntary willingness to persist with physical activities [4,5]. However, Sun's (2012) longitudinal study revealed a critical caveat: while situational interest in the gamified group remained higher than in traditional teaching, motivation levels in both groups declined in later stages [6,7]. This suggests that gamification design requires dynamic adjustments to sustain long-term effects.

In summary, while numerous studies confirm that motivation and situational interest in physical education can be boosted in the short term, the gradual decline over time highlights the need for ongoing innovation and adaptability in both technological and pedagogical approaches.

Methods and structure of the study. A total of 64 students aged 18–20 were divided into experimental and control groups, each subjected to different teaching methods for comparison.

Control Group: received traditional sports skill instruction, which was teacher-centered and followed a structured process of: Explanation and demonstration, Imitative practice, Error correction, and Repeated drills.

Experimental Group: pre-class, teachers uploaded PPT slides, demonstration videos, and slow-motion animations to a digital platform, guiding students in self-directed learning through group discussions and Q&A. In-class, students wore Meta Quest 3 VR headsets to enter a virtual tennis court, where they practiced swing techniques in competitive scenarios. Teachers facilitated group-based swing drills, while a machine learning-powered smart training system captured and analyzed students' training videos and kinematic data.

Measurement Tool: The Sport Motivation Scale (SMS), grounded in Self-Determination Theory (Pelletier et al., 1995, 2001), was used to assess motivational differences between the two teaching approaches. The scale covers seven subdimensions: three types of intrinsic motivation (to know, to accomplish, to experience stimulation), three types of extrinsic motivation (identified, introjected, external regulation), and amotivation.

Results of the study and discussion. Pre-test results showed that all 12 items had p-values greater than 0.05 ($p>0.05$), indicating no significant differences between the experimental (EG) and control groups (CON) prior to the intervention. Post-test results revealed that all p-values were below 0.05 or 0.01, demonstrating that the experimental group scored significantly higher than the control group across all dimensions of intrinsic motivation. The experimental teaching method (incorporating VR, intelligent systems, and online interaction) significantly enhanced students' intrinsic motivation, whereas the traditional approach failed to maintain or improve motivation levels, even showing slight declines. These findings validate the application of Self-Determination Theory in physical education: the interactivity, feedback mechanisms, and immersive nature of technology-assisted instruction effectively satisfy students' psychological needs, thereby strengthening intrinsic motivation. The motivational decline observed in the traditional control group underscores the necessity for pedagogical innovation.

In conclusion, the experiment demonstrates the significant advantages of digital approaches in enhancing college students' motivation for physical education learning.

This table compares the effects of different teaching methods on external motivation in college students' physical education. Before the experiment, there were no significant differences between the CON and the EG in all motivation indicators ($P > 0.05$); Post-experiment, the experimental group significantly outperformed the control group in all types of external motivation (identification regulation, internal regulation, and external regulation) ($P < 0.01$ or $P < 0.05$), with the most notable improvements observed in the enhancement of health value identification and social interaction. The results indicate that the teaching methods employed in the experimental group effectively enhance students' external motivation, particularly by emphasizing the

Table 1. Comparative analysis of the effects of digital teaching methods and traditional teaching methods on college students' intrinsic motivation in physical education

Motivation	Question	Before experiment			After experiment		
		CON	EG	Sig P	CON	EG	Sig P
Intrinsic Motivation-To Know	Because sports activities allow me to learn more about the sports I participate in, which brings me a lot of joy.	5.28±1.17	5.19±1.73	>0.05	4.88±1.07	5.88±1.16	<0.01
	To experience the joy of discovering new training methods.	5.16±1.25	5.47±1.21	>0.05	4.81±1.00	5.78±1.31	<0.01
	To derive a sense of pleasure from learning new techniques that I have never practiced before.	5.13±1.21	5.31±1.18	>0.05	4.81±0.86	5.69±1.18	<0.01
	To experience the joy of discovering new activity strategies.	5±1.22	5.09±1.30	>0.05	4.78±0.79	5.50±1.19	<0.01
Intrinsic Motivation-To Accomplish	Because when I master relatively difficult sports techniques, I feel a sense of self-fulfillment.	5.22±1.21	5.28±1.05	>0.05	5.13±1.04	5.88±1.29	<0.01
	To experience the joy of overcoming some of my weaknesses.	4.88±1.34	5.25±1.24	>0.05	4.78±0.83	5.47±1.34	<0.05
	To feel a sense of fulfillment when my abilities improve.	5.09±1.20	5.28±1.20	>0.05	4.88±1.01	5.56±1.34	<0.05
	Because I feel joy when I complete a challenging movement.	5.16±1.25	5.41±1.16	>0.05	4.75±1.08	5.72±1.11	<0.01
Intrinsic Motivation-To Experience Stimulation	Because I feel joy in exciting experiences.	5.38±1.19	5.03±1.60	>0.05	4.75±1.02	5.88±1.19	<0.05
	To feel the excitement of being fully immersed in sports activities.	5.09±1.20	5.25±1.14	>0.05	4.94±0.67	5.75±1.12	<0.01
	Because I experience a strong passion when engaging in sports activities I love.	5.13±1.24	5.28±1.11	>0.05	5.00±0.84	5.66±1.13	<0.05
	Because I enjoy the feeling of being fully immersed in the activity.	5.03±1.18	5.25±1.19	>0.05	4.78±0.87	5.53±1.19	<0.01

health benefits and social value of physical activities.

The study results showed that there were no significant changes in the motivation dimension between the experimental group and the control group. This indicates that the foundation for physical activity participation among college students aged 18–20 is relatively solid, and short-term instructional interventions (whether technology-assisted or not) did not trigger a motivation deficit crisis. Although the experimental group slightly alleviated the perception of "inability to achieve success" through the intelligent feedback system (a 0.57-point decrease in Project 5 scores), it failed to significantly address deeper issues of identity disconnection or goal attainment barriers. These results align with the motivational continuity framework of self-determination theory, which posits that the resolution of amotivation requires long-term cognitive restructuring rather than mere technical enhancements to perceived competence. Future research should integrate identity intervention with personalized goal management to further mitigate potential amotivational risks.

Conclusions. Compared to traditional teaching methods, digital teaching methods that integrate VR technology, intelligent feedback systems, and online interaction can significantly enhance college students' motivation for physical education learning: the experimental group showed significant increases in all dimensions of intrinsic motivation (knowledge-seeking, achievement, stimulation experience, and internalization) ($P<0.01$), and successfully promoted the internalization of extrinsic motivation (identification motivation $P<0.01$); Meanwhile, the level of amo-

Table 2. Comparative analysis of the impact of external motivation on college students' physical education under different teaching methods

Motivation	Question	Before experiment			After experiment		
		CON	EG	Sig P	CON	EG	Sig P
Extrinsic Motivation-Identified	I believe that participating in physical activities is essential for maintaining good health.	5.16±1.22	5.38±1.24	>0.05	5.03±0.74	6.06±1.19	<0.01
	Because I must engage in physical activities to feel good about myself.	4.94±1.22	5.06±1.22	>0.05	5.03±0.78	5.53±0.98	<0.05
	If I don't spend some time on physical activities, I feel unhappy.	4.59±1.04	4.53±1.30	>0.05	4.31±0.97	5.09±1.30	<0.01
	Because I must exercise regularly.	4.44±1.32	4.66±1.49	>0.05	4.38±1.01	5.06±1.39	<0.05
Extrinsic Motivation-Introgected	I believe that physical activities are one of the best ways to interact with others.	4.75±1.10	4.84±1.32	>0.05	4.72±1.00	5.72±1.25	<0.01
	Because physical activities are one of the best ways I have chosen to promote my development in other areas.	4.78±1.26	4.97±1.28	>0.05	4.49±0.91	5.72±1.11	<0.01
	Through physical activities, one can learn many things that are beneficial to other aspects of life.	5±1.16	5.31±1.15	>0.05	4.91±0.89	5.78±1.10	<0.01
	Because physical activities are one of the best ways for me to maintain good relationships with my friends.	4.84±1.27	4.91±1.38	>0.05	4.44±1.11	5.13±1.29	<0.05
Extrinsic Motivation-External Regulation	Because physical activities earn me the respect of my acquaintances.	4.22±1.29	4.44±1.22	>0.05	4.13±0.71	4.97±1.40	<0.01
	For the reputation of being an athlete.	3.47±1.19	3.56±1.88	>0.05	3.38±1.21	4.13±1.31	<0.05
	Because the people around me believe that a healthy body is very important.	4.81±1.26	5.28±1.35	>0.05	4.67±1.15	5.5±1.30	<0.01
	To show everyone how skilled I am at physical activities.	3.88±1.24	3.84±1.57	>0.05	3.19±1.47	4.13±1.07	<0.01

Table 3. Comparison of college students' lack of motivation in physical education under different teaching methods

Question	Before experiment			After experiment		
	CON	EG	Sig P	CON	EG	Sig P
I have always had good reasons to exercise, but now I am not sure if I should continue participating in sports.	4.00±1.02	3.88±1.95	>0.05	3.78±1.41	3.59±1.88	>0.05
I feel that I cannot succeed in the sports activities I participate in.	3.41±1.04	3.88±1.72	>0.05	3.50±1.41	3.31±1.94	>0.05
I am not sure at the moment, but I do believe that my identity is unrelated to sports activities.	4.50±1.41	4.31±1.58	>0.05	3.50±1.38	3.34±1.64	>0.05
I often tell myself, "It seems that I cannot achieve the goals I have set for myself. "	3.63±1.39	3.50±1.48	>0.05	3.84±1.11	3.72±1.91	>0.05

tivation remained stable between the two groups (all items $P > 0.05$), reflecting the resilience of college students' baseline willingness to engage in physical activity against intervention. This result validates the core mechanism of self-determination theory—technology-enabled learning effectively drives the transformation of motivation toward intrinsic motivation by fulfilling the needs for autonomy (VR exploration), competence (real-time feedback), and relatedness (community interaction). However, addressing the underlying risks of amotivation requires the long-term integration of identity-based strategies.

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Teaching students at a management university to swim with the aim of reducing motor dysfunctions caused by a fear of water

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Abstract

Objective of the study is to experimentally substantiate methodological techniques that help overcome fear of water among students at a management university.

Methods and structure of the study. The sample for the scientific study included 65 university students majoring in management, aged 19.5±0.7 years, who did not know how to swim. To measure the level of fear of water, a fear factor questionnaire was used, adapted to the process of learning to swim and consisting of 10 questions. Basic swimming skills were taught over a period of six weeks, with three 60-minute lessons per week.

Results and conclusions. Teaching basic swimming skills leads to a reduction in fear of water. The development of mental qualities in learners, such as endurance and self-control when in the water, is possible through the use of teaching methods for basic swimming skills, which expand the practical scope of their application in an aquatic environment.

Keywords: *fear of water, swimming lessons, students, motor dysfunction, teaching methods.*

Introduction. As a unique human activity in an aquatic environment, the ability to swim is a basic skill for performing many professional and practical tasks. The process of learning to swim is characterized by a multifunctional approach to mastering movements in an aquatic environment [5]. Swimming skills are important both for saving one's own life and for rescuing people in distress in the water [6]. Games in the aquatic environment have great potential for the physical development of children, so swimming skills can be developed at an early age [3].

At the same time, an unfamiliar aquatic environment can cause negative, uncontrollable psychological and physiological reactions that adversely affect learning productivity [2].

When teaching students to swim, negative emotions may arise, causing certain physiological and motor dysfunctions that negatively affect the acquisition of swimming skills [4]. Overcoming fear of water when teaching basic swimming skills is an important task in physical education for students [1].

Objective of the study is to experimentally substantiate methodological techniques that help overcome fear of water among students at a management university.

Methods and structure of the study. The sample for the scientific study included 65 university students majoring in management, aged 19.5±0.7 years, who did not know how to swim.

To measure the level of fear of water, a fear factor questionnaire adapted to the process of learning to swim and consisting of 10 questions was used. The answers were graded on a 5-point scale as follows: 'I am very afraid of water' – 5 points; 'I am quite afraid to enter the water' – 4 points; 'I am moderately afraid of water' – 3 points; 'I have a slight fear of water' – 2 points; 'I have no fear of the aquatic environment' – 1 point.

Basic swimming skills were taught over a period of six weeks, with three 60-minute lessons per week. The lessons included a preparatory part (warm-up exercises on land), a main part (solving educational and applied tasks in the water) and a final part (bringing the body to a relatively calm state).

Basic swimming skills included:

- contact with the aquatic environment: getting used to water, diving under water with eyes closed and open in the shallow end of the pool, walking and running forwards and backwards, jumping out of the water;
- using the buoyancy of water: lying on the water in a group, lying on the surface of the water in a prone and supine position;
- maintaining a horizontal streamlined body position: gliding by pushing off from the side of the pool in a prone and supine position.
- the skill of synchronizing breathing and using positive buoyancy;
- the skill of staying upright in the water by alternating leg movements ('walking in the water');
- jumping into the water from various positions;
- skills of swimming the front crawl without taking your arms out of the water;
- skills of swimming and resting on your back.

Results of the study and discussion. The results of the study indicate that the development of basic swimming skills significantly reduces the level of fear of water.

The average value of subjective perception of water phobia factors in the formation of basic swimming skills decreased from 3.8 points to 1.8 points, which corresponds to the practical absence of negative perceptions of the aquatic environment and ensures reliable mastery of sports swimming techniques. The recorded decrease in fear of water, assessed on the scale of the adapted questionnaire of fear factors, correlates with the skills of using the buoyancy of water, maintaining a horizontal streamlined body position, breath synchronization using positive body buoyancy, staying upright in the water by alternating leg movements, jumping into the water from various positions, swimming the front crawl without taking your arms out of the water, and resting on your back.

The emphasis on awareness of reliable safety measures on the part of the instructor and practical familiarization with the properties of water through differentiated exercises performed in shallow and deep parts of the pool formed a sense of conscious confidence when in the water. This confirms that mastering practical swimming skills has a positive effect on the psychological state and emotional stability of those involved.

Taking into account the psychological characteristics, abilities and inclinations of students fosters a sense of confidence, awareness and protection from the stressful factors of the aquatic environment. Monitoring decision-making and providing assistance from the instructor increases the effectiveness of managing the current and general psychological state of students when they are in an unfamiliar environment performing motor actions. Based on the predicted outcome, the instructor includes a combination of differentiated exercises in the training program aimed at overcoming the students' fear of the most negatively perceived factors of aquaphobia.

The use of diverse and universal support tools that increase positive buoyancy at the initial stage of training helps to overcome fear of water through a feedback

Table 1. Dynamics of subjective perception of factors contributing to fear of water

Factors contributing to fear of water	Before	After	t	p
Lifting objects from the bottom of the shallow end of the pool with a depth of 0.8 m	4,1±0,2	1,3±0,9	4,4	< 0,05
Lifting objects from the bottom of the pool with a depth of more than 2 m	4,2±0,5	2,2±0,5	3,6	< 0,05
Games in the shallow end of the pool with waves and splashes	2,8±0,3	1,9±0,6	3,7	< 0,05
Diving into the water with head	2,3±0,7	1,9±0,3	2,4	< 0,05
Jumping into the water from a height of 1 m	4,6±0,2	2,3±0,5	4,8	< 0,05
Opening eyes in the water while swimming	3,4±0,2	1,6±0,5	2,2	< 0,05
Swimming when there are no other swimmers in the lane	3,9±0,9	1,8±0,7	3,1	< 0,05
Swimming when the bottom is not visible	4,3±0,1	1,4±0,3	3,5	< 0,05
Resting on back when tired	4,8±0,8	2,8±0,2	3,7	< 0,05
Climbing out of the water using a ladder with jumping movements	3,6±0,3	1,2±0,1	2,6	< 0,05

cycle. This task is accomplished on a new instrumental basis – by strengthening the internal connections between the acquisition of basic swimming skills and the reduction of fear of the aquatic environment. New opportunities for programming a positive psychological state and confidence in one's own abilities are achieved by moving to a higher level of mastery of basic swimming skills and simulating practical conditions for their application.

The use of free activities and games in the water stimulated adaptation and a positive response from students, reducing their level of anxiety in the aquatic environment. There is a noticeable trend of psychological stimulation associated with the concentration of trainees on the immediate mastery of swimming skills. The resources for mastering basic swimming skills have expanded the possibilities for overcoming fear of water and improving the overall psychological state of students.

Conclusions. Teaching basic swimming skills leads to a reduction in the level of fear of water. The development of mental qualities in learners, such as endurance and self-control when in the water, is possible through the use of teaching methods for basic swimming skills, which expand the practical scope of their application in an aquatic environment.

The versatility of basic swimming skills is reflected in their multifunctional application and stimulates the integrated development of sports swimming techniques and water environment competencies, which are of high practical importance.

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Improving the endurance of management students with the help of alternative aerobic means

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Abstract

Objective of the study is to evaluate the effectiveness of various aerobic forms of physical activity in developing the endurance of students majoring in management.

Methods and structure of the study. The relationships between the load characteristics of aerobic motor activity and changes in endurance indicators were studied in 48 students aged 18.5±1.6 years, represented by groups engaged in athletics, hiking, cycling, and swimming.

Results and conclusions. According to the developed training programs, the content of endurance development measures is focused on triggering mechanisms of adaptation to cyclic loads in uniform modes of functioning of the motor-cardiac sphere. The strength of the links between the use of alternative means of physical activity and the level of endurance development indicates the advisability of selectively using the content and technological components of physical activity in solving the tasks of physical education for students.

Keywords: *development of endurance, students, types of physical activity, cyclic loads.*

Introduction. The imperatives of the National Project 'Sport – the Norm of Life' are the development of physical qualities in young students, the most important of which is endurance [5]. Student age is the most favorable period for developing endurance without resorting to maximum and submaximal intensity loads [4].

To develop general endurance in physical education classes, steady long-distance running in aerobic mode is usually used [3]. At the same time, there are many types of physical activity that are attractive to students and contribute to the development of endurance, including running of varying duration [2].

The modern concept of sports training is based on the fact that adaptation processes depend mainly on the magnitude of training stimuli and the body's response, which is largely determined by the individual characteristics of the person exercising [1].

Despite numerous studies, to date, no universal, universally recognized system has been developed that allows for precise control of students' aerobic capacity. Given that the adaptive capabilities of students under the combined influence of physical and educational factors are limited, the most important task of physical education is to develop means of varying the specificity of training loads with a general focus on improving the aerobic capacity of students. At the same time, it should be noted that the use of various means of physical activity makes an unequal contribution to improving the functional base of students, which can have both a stimulating and a destructive effect on the formation of students' educational competencies.

Objective of the study is to evaluate the effectiveness of various aerobic forms of physical activity in developing the endurance of students majoring in management.

Methods and structure of the study. During the training program, the relationships between the load characteristics of various aerobic forms of physical activity and changes in the endurance indicators of 48 students aged 18.5±1.6 years, belonging to the main group in terms of health status for physical education classes, represented by groups of athletics, hiking, cycling, and swimming.

Track and field running classes were held three times a week for 4 months in the form of cross-country training on various surfaces, avoiding hard ground. Shoes with shock-absorbing soles were used. The running pace was selected individually. Initially, low-intensity aerobic running loads (120-130 bpm) were used, which were alternated with walking when necessary. The duration of continuous running was 7-10 minutes at the start and was gradually increased to 30-40 minutes. The pedagogical emphasis was placed on deep breathing with powerful short exhalations.

Hiking involved walking certain tourist routes of varying length, elevation and difficulty. Hiking trips lasted 1 time a week for about 4-6 hours with a 10-15 minutes' rest after each hour of hiking, as well as shorter breaks of 1-3 minutes after intense movement (15 minutes) associated with overcoming difficult terrain. The main type of exercise was aerobic, with short intervals of mixed aerobic and anaerobic exercise when walking uphill. The intensity of the exercise, controlled by heart rate, was 120-130 bpm; during breaks, the heart rate was brought down to 80-90 bpm.

Cycling included cyclical exercise twice a week with high energy expenditure based on cycling skills. Classes lasting 1-3 hours were held in a group of the same physical fitness level; city routes alternated with riding on roads in rough terrain where cyclists were allowed. The intensity of the load varied from low to medium, and the heart rate was 125-140 bpm.

The swimming group included students who were confident in their ability to move in the water using their chosen method. Endurance training included steady swimming for 30-40 minutes at a heart rate of 125-135 bpm. Each training session included swimming in a specific style (except for butterfly). Before the start of the session, flexibility and joint mobility exercises were performed in the water.

The level of general endurance was assessed using special exercises.

Results of the study and discussion. According to the training programs developed, the content of endurance development measures focuses on triggering mechanisms of adaptation to cyclic loads in uniform modes of functioning of the motor-cardiac sphere (Table 1).

The focus of the program material, which includes combinations of low- and medium-intensity aerobic exercises used to plan and select possible options for class content, expands the possibilities for technological approaches to developing students' endurance. The validity of the polystructural approach is indicated by a reliable increase in endurance indicators in the physical education structure of the test subjects from 4.3% to 12.8% in each of the structural components of the educational model implementation.

In the basic configuration, hiking equipment, which increase the aerobic capacity of the body by varying the intensity of the load, elevation changes, length and complexity of tourist routes, have a high developmental potential, which indicates the resonant nature of adaptive restructuring that forms a new essence of students' physical fitness.

Cycling tourism resources lay the foundation for the transition of physical education to a higher aerobic regime based on the transformation of operational tools and the stimulation of energy supply capacity.

The functionality of swimming training has determined the development of special endurance based on swimming skills. The steady growth of functional capabilities and the power of energy systems is set by the target guidelines of the training process, corresponding to the level of functional preparedness of students.

Table 1. Dynamics of student endurance indicators

Indicator	before	after	P-value	
3 km run, s	755,7±26,7	672,3±28,4	3,4	< 0,05
5 km walk, s	2846,1±128,5	2661,4±234,2	6,0	< 0,05
10 km cycle, s	1486,1±334,8	1179,3±345,9	5,6	< 0,05
300 m swim, s	297,7±67,2	279,5±45,2	6,1	< 0,05

The representativeness of changes in the energy supply of muscle activity is due to adaptive processes that stimulate aerobic mechanisms for improving performance, hemodynamics and energy metabolism when mastering each of the physical education programs.

The selective choice of the type of physical activity determines the balance and expediency of using various means to improve the functioning of bioenergetic systems responsible for the aerobic supply of muscle work.

The developed options for the selective use of alternative means of physical activity, based on the specificity of the training impact with a general focus on improving the aerobic capabilities of students, ensure an effective increase in the functional capabilities and quality of endurance of students.

Conclusions. The results obtained prove the effectiveness of meaningful variation in training programs based on cyclical means of developing endurance with uniform prolonged exposure to moderate-intensity loads. The strength of the links between the use of alternative means of physical activity and the level of endurance development indicates the advisability of selectively using content and technological components of physical activity in solving the tasks of physical education for students.

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Factors contributing to increased physical activity among young people of working age

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Abstract

Objective of the study is to identify motivational factors for involving able-bodied young people in physical education.

Methods and structure of the study. Based on a survey of 920 students, three key motivational blocks were identified: self-affirmation (especially significant for physically active young men), health (a universal priority) and self-improvement (important for young women).

Results and conclusions. It has been established that 61.2 % of physically active young men and 60.2 % of young women consider health improvement to be their main motivation, while competitive motives are significant for 52.3 % of active young men compared to 26.3 % of physically inactive young men. The authors propose a differentiated approach to motivating able-bodied young people, taking into account gender characteristics and levels of physical activity, with an emphasis on competitive programs for boys and fitness activities for young women.

Keywords: *physical activity, able-bodied youth, healthy lifestyle, physical culture, health development.*

Introduction. Physical education specialists note that students' lack of involvement in physical education and sports activities is largely due to young people's weak orientation towards the values of health and a healthy lifestyle. This problem is linked both to the absence of strong cultural and historical traditions promoting physical perfection and to a lack of internal motivation to participate in sports. Meanwhile, it is motivation, understood as a conscious desire to achieve set goals, that plays a decisive role in forming a lasting interest in physical activity and is a key factor in the successful organization of physical education and health-improving activities among young students.

Objective of the study is to identify motivational factors for involving able-bodied young people in physical education.

Methods and structure of the study. The methodological basis of the study was based on the use of a questionnaire survey, which allowed us to obtain representative data on the self-assessment of the motivational attitudes of employable young people. An adapted version of a standardized questionnaire developed by specialists from the Saint-Petersburg Scientific-Research Institute for Physical Culture. This methodology was modified to take into account current trends in the field of physical education for young people. The study involved 920 respondents (501 girls and 419 boys) aged 16 to 24, who are citizens of the Russian Federation and represent various regions of the country.

To ensure the validity of the results and identify significant differences in motivational profiles, all participants were divided into two contrasting groups based on their level of physical activity: low physical activity group (n = 578): able-bodied young people who devote 60 minutes or less to physical exercise 2 or fewer days a week (350 young women and 228 young men) and a group with high physical activity (n = 342): able-bodied young people who engage in physical activity for at least 60 minutes a day 5 or more times a week (151 young women and 191 young men).

The study included an assessment of the importance of various motivational factors using a three-point Likert scale (‘very important,’ ‘quite important,’

'not important'). Participants were asked to assess the importance of three main categories of motivation: competitive motivation ('to win'); health motivation ('to improve my health'); aesthetic motivation ('to look good').

To ensure the methodological rigor of the study, modern methods of statistical analysis were used. Responses between groups were compared using the χ^2 (Pearson's chi-square) criterion with statistical significance levels set at $p < 0.05$ and $p < 0.01$. This approach made it possible not only to identify differences in motivational profiles, but also to determine the degree of their statistical reliability.

The study paid particular attention to analyzing gender differences in motivational preferences, as well as identifying potential correlations between the level of physical activity and the dominant types of motivation

Results of the study and discussion. Data analysis showed a clear correlation between the frequency of physical activity and the significance of various motivational factors, revealing both general trends and gender-specific characteristics.

Health motivation ('to improve health') was the leading factor for all categories of respondents. However, interesting patterns were observed here: among physically active young men, the significance of this motive was significantly higher (61.2 % versus 47.8 %), with a difference of 13.4 percentage points that was statistically significant ($\chi^2 = 10.352$ at $p < 0.01$). Among young women, the health motive dominated in both groups (56.2 % and 60.2 %), but the differences were not statistically significant.

Competitive motivation ('to win') showed the most pronounced differences between the groups. Among young men with low physical activity, about a quarter of respondents (26.3%) considered this factor to be extremely important, while in the group with high activity, the absolute majority of respondents (52.3 %) gave this answer. At the same time, about 37 % of inactive young men did not attach any importance to the competitive aspect, while among physically active young men, only 19.8 % felt this way. The statistical significance of these differences is confirmed by high χ^2 values (31.644 at $p < 0.01$). A similar trend was observed among young women: 49.0 % of physically active participants versus 17.1 % of physically inactive young women rated competitive motivation as the most important. The largest gap between the groups (22.9 percentage points) was recorded for the answer 'not important', which was also statistically confirmed ($\chi^2 = 32.491$ at $p < 0.01$).

Aesthetic motivation ('to look good') showed the following results: among young men, the difference between the groups was 16.1 percentage points for the answer 'very important' (49.7 % of physically active men versus 33.6 % of inactive men, $\chi^2 = 12.584$ at $p < 0.01$). Among young women, this motive was important for the majority in both groups (50.9 % and 54.2 %), but the differences were not statistically significant.

Based on the data obtained, three motivational blocks can be identified. The self-affirmation block (competitive motivation) is characteristic of active students, especially young men. The health block is a universal factor that is significant for all categories of working-age youth. The self-improvement block (aesthetic motivation) is especially important for girls, regardless of their level of physical activity.

Thus, the priority motive for the absolute majority of working-age youth, regardless of their current level of physical activity, is to improve their health. This basic factor occupies a leading position in the hierarchy of motivational preferences among both young men and young women, confirming the universal value of the health aspect of physical culture.

However, the analysis revealed significant gender differences in additional motivational factors. A significant proportion of young men, especially those who are actively involved in sports, demonstrate a pronounced orientation towards competitive motives and self-affirmation through sporting achievements. This is manifested in the high importance of aspects such as 'the desire to win' and 'demonstrating physical superiority'. At the same time, young women are more oriented towards self-improvement and the aesthetic aspects of physical activity, which is reflected in their particular attention to criteria such as 'good physical shape' and 'attractive appearance.'

Conclusions. The results obtained are of great practical importance for the development of an effective system to motivate students to engage in regular physical education activities. The key focus of such work should be the formation of a sustainable motivational and value-based attitude towards physical education and sports activities. This process requires a comprehensive approach and includes several interrelated components: the cognitive component – forming a holistic understanding among students of the value of physical education, its role in maintain-

ing health and improving quality of life; emotional and evaluative component – developing a positive emotional attitude towards classes, creating conditions for enjoying physical activity; and behavioral component – encouraging regular physical education and sports activities both as part of the compulsory program and outside school hours.

To achieve maximum effect, it is necessary to take into account the individual characteristics of the motivational sphere of different groups of students. For young men, it is particularly important to create conditions for the realization of competitive ambitions through a system of sporting events and competitions at various levels. For young women, programs focused on the aesthetic aspects of physical activity (fitness programs, dancing, gymnastics) with an emphasis on body shaping and improving appearance may be more effective. Male and female students with low levels of physical activity require a special approach aimed at overcoming barriers and creating a positive experience of exercise.

The most important condition for successful motivational work is a differentiated approach that takes into account gender-specific characteristics of motivation, current level of physical activity, personal preferences and interests, and individual physical abilities. Implementing such an approach requires the development of various forms of physical education and sports activities, the creation of a flexible system of sectional classes, and the introduction of modern methods of motivational support. Particular attention should be paid to creating a positive social climate around physical education, promoting a healthy lifestyle, and developing infrastructure for sports and health activities. Only by taking all these factors into account can we foster a lasting internal motivation among students to engage in regular physical activity, which will ultimately contribute to improving their health, quality of life, and success in their studies and future professional activities.

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Successes and development horizons of the department of physical education and sports and mass work at the herzen state pedagogical university of russia

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Abstract

Objective of the study is to provide methodological justification for the socio-didactic impulses for the development of physical education at Herzen University.

Methods and structure of the study. Archives on the history of physical education at the university, data from historical and archival documents, abstracts of analytical reports by university staff from different years, and recollections of contemporaries of historical events at the Department of Physical Education and in the sporting life of the Herzen State Pedagogical University of Russia were studied, and a retrospective analysis of periodicals was conducted.

Results and conclusions. The dynamic nature of the physical education system at Herzen University highlights the diversity of its functions in training future school education specialists. The contradictions arising in the current model of physical education are drivers for the development of the department and the growth of its role in training well-rounded specialist teachers.

Keywords: *Herzen University, Department of Physical Education and Sports and Mass Work, prospects for development, physical culture.*

Introduction. The history of the Department of Physical Education and Sports at the Herzen State Pedagogical University covers a wide range of issues related to the theory, practice, and development of pedagogical science in the field of physical culture and sports during various periods of our country's existence.

A study of the historical trends in the functioning of the department and student sports at Herzen University leads to the assumption that the development of physical education and sports allows for the improvement of educational indicators and the healthy lifestyle competencies of students, as well as preparing graduates for professional pedagogical activity in the field of school education [1]. In accordance with this assumption, it should be noted that the work of the department at all stages of its development is characterized by a certain combination of teaching forms and methods that determine the structure of the educational, methodological, scientific and personnel activities of the teaching and laboratory staff [5]. The subject of the study relates to the study of the conditions, incentives and prospects for the development of the Department of Physical Education and Sports and Mass Work [4].

Objective of the study is to provide methodological justification for the socio-didactic impulses for the development of physical education at Herzen University.

Methods and structure of the study. The archives on the history of physical education at the university, data from historical and archival documents, abstracts of analytical reports by university staff from

different years, and recollections of contemporaries of historical events at the Department of Physical Education and in the sporting life of the Herzen State Pedagogical University were studied, and a retrospective analysis of periodicals was conducted.

The methodological basis for solving the research problem is formed by the studies of scientific experts from Herzen University, in particular, the works of A.A. Nesterov, S.L. Fetisova, I.N. Venediktov, G.N. Ponomarev, A.V. Zyukin, E.G. Saikina, O.E. Ponimasova, and A.M. Fokin. A systemic-historical approach was used to solve the research tasks.

Results of the study and discussion. The starting point for the development of the Institute of Physical Culture and Sport at Herzen State Pedagogical University was the establishment on 1 September 1925 at the Leningrad Pedagogical Institute, which later became part of one of the oldest physical education faculties in the country, training teachers with higher physical education and pedagogical education.

Over the years, the department was headed by G.A. Dyperron (1925-1930), E.V. Vershinsky (1930-1946), V.V. Lazak (1946-1949), T.V. Kopelman (1949-1967), M.I. Semenov (1967-1982), I.P. Potapchenko (1982-1987), V.S. Kunarev (1987-2017), A.V. Zyukin (2017-2020), and A.M. Fokin (since 2020).

The creation of a separate structural and educational unit responsible for the physical education of students was due to the socially oriented model of physical education in the country, which promotes the comprehensive and harmonious development of school teachers. To this end, the Department of Physical Education had sufficient physical education and sports facilities to meet the needs of students both in the summer (at the stadium) and in the winter (at the ice rink). The department's resource base was supplemented by six sports halls.

The methodological approach to the department's activities during the Great Patriotic War was an applied model of physical education. The basis of the applied model of physical education during the war years was the functioning of shooting, skiing, aviation, and parachuting sections at the pedagogical institute, as well as OSIAVAKHIM clubs – motorcycle, medical, and aircraft modelling.

In the 1950s, the department's methodological experience was enriched by didactic forms and methods of organizing and conducting sectional sports and mass work in sports specializations: sports and artistic gymnastics. The constructiveness of the chosen direction is indicated by the variety of training programs developed in 1957 for the following departments: sports gymnastics, artistic gymnastics, athletics and basketball, taking into account the predisposition of students to the chosen type of physical activity [2].

The conditions for the sustainable development of the department in the 1960s-1980s were: practical contributions to the theory and methodology of physical education, and the preparation and defense by teachers of a number of candidate and doctoral dissertations on physical education and sports training. The basis for the development of student sports during this period was the implementation of groundbreaking scientific ideas and technologies in the practice of training the strongest athletes of the pedagogical institute.

During the difficult transition period of the 1990s, based on management decisions, the department managed to preserve a model of physical education focused on mass sports activities and overcome the position of catching up [3]. The target indicators of steady progress during this period were openness, competitiveness, and permanence of development. Analysis shows that the maximum realization of developmental functions is achieved during mass sports festivals such as “Freshers” Day' and “Herzen's Ring”.

In the mode of advanced development, the department's teachers conducted research work on physical education, sports training of students, and adaptive physical culture. There is a visible connection between the quantitative and qualitative indicators of dissertation research and the growth of the department's scientific and methodological potential.

A natural consequence of the creation of the Sports and Health Centre in 2007 on the basis of the department is a significant increase in the number of people participating in general development programs of additional education, as well as the development of educational, sports and methodological facilities. The qualitative restructuring of sports and mass work was manifested in the annual holding of the University Spartakiad in 19 sports, which provides for a multilevel system for determining the winner.

The beginning of the 21st century is associated with a qualitative adjustment of physical education, which provides for the solution of problems facing future secondary school subject teachers. This period was characterized by the orientation of students' social needs towards healthy lifestyle standards, maintaining activity and vital functions of the body.

Currently, there is a pressing issue of the parametric compatibility of resource, communication and personnel support for the educational process with foreign students, which shapes the sovereignty of national segments of physical education.

Domestic priorities in the educational digitalization strategy are driving the introduction of electronic educational technologies into the physical education process for students. The department is implementing electronic training courses, as outlined in the higher education strategy, on a video content platform for innovative educational projects. Monitoring of the results shows that the potential impact of the research project 'Physical education and sports activities outside of class time in the educational environment of a university,' initiated by the department in 2023, has a significant effect on the physical and motor parameters and physical fitness of students. The inclusion in the contextual field in 2022 of the information and educational project promoting the achievements of leading athletes of Herzen University, 'Know Our People!', complements the motivational incentives for students to engage in physical education.

Over the past five years, there has been a clear link between the growth in grant applications and the increase in the information capital of the department's teaching staff.

Constructive measures taken by the management of the educational unit at the organizational, methodological and scientific levels determine the dynamics of innovative development and increase the educational potential of the department. The representation of breakthrough ideas and technologies in physical education and sport is achieved through the participation of teachers in advanced training programs for additional professional education.

Conclusions. A study of the development trends of the Department of Physical Education and Sports at Herzen University, conducted on the basis of a systemic-historical approach, revealed the objective conditioning of its functions by the nature and characteristics of physical education at various stages of the development of domestic pedagogical education.

The dynamic nature of the physical education system for students at Herzen University emphasizes the diversity of its functions in training future specialists in school education. The emerging contradictions in the current model of physical education are drivers for the development of the department and the growth of its role in training well-rounded specialist teachers.

The emerging functions of the Department of Physical Education and Sports and Mass Work require creative initiative from the teaching staff in the rapidly changing conditions of modern education.

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Demanded competencies of specialists in human resource development in physical culture and sports organizations

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Abstract

Objective of the study is to analyze the demand for specialists with various qualifications in order to improve the effectiveness of organizations in the field of physical culture and sport in the Russian Federation.

Methods and structure of the study. In 2024, the Saint-Petersburg Scientific-Research Institute for Physical Culture (SPbSRIFPC) conducted an online survey of specialists from state and municipal physical culture and sports organizations located in 82 constituent entities of the Russian Federation (n=2059) using specialized software.

Results and conclusions. The article presents the priorities identified during the study regarding the demand for various groups of specialist competencies, and also examines the demand for specific competencies within the most significant groups. According to the survey results, the most sought-after competencies for the development of the human resources potential of organizations in the three-year perspective are the groups of competencies related to the organization and conduct of physical education and sports events, legal support for physical education and sports, IT technologies and digitalization processes in sport, as well as financial and economic planning.

Keywords: *competence, human resources, physical culture and sports, demand for specialists.*

Introduction. According to the provisions of the Strategy for the Development of Physical Culture and Sport in the Russian Federation until 2030, approved by Decree of the Government of the Russian Federation No. 3081-r of 24 November 2020, by 2030, the physical culture and sport sector is expected to employ 649,000 full-time staff. One of the key objectives of the Strategy and related policy documents is to increase the proportion of citizens who regularly engage in physical culture and sports, which implies achieving the following targets: up to 90% among children and young people, up to 70% among middle-aged people, and up to 45% among older citizens [1].

The projected expansion of physical activity coverage among the population is to be achieved by increasing the number of new facilities for physical education and sports, as well as by modernizing the infrastructure of existing organizations of various organizational and legal forms. Another area of work to engage the population is the development of sports clubs and facilities in places of residence, professional activity or educational institutions.

An essential component of achieving the planned indicators of population involvement in physical education and sports is the training of specialists who can effectively address issues related to the organization, methodological support and management of newly created or modernized physical culture and sports organizations, as well as adapting the activities of organizations to current socio-economic conditions.

Objective of the study is to analyze the demand for specialists with various qualifications in order to improve the effectiveness of organizations in the field of physical culture and sport in the Russian Federation.

Methods and structure of the study. In order to identify priorities in the demand for specialist compe-

tencies that are considered particularly important in the activities of various types of physical culture and sports organizations, in 2024, SPbSRIFPC staff conducted a survey using a questionnaire. During the survey, an analysis was conducted of the demand for various groups of specialist competencies over the next three years.

Particular attention was paid to the groups of competencies that proved to be the most significant, with further detailing by areas within these groups. In order to identify the maximum diversity of knowledge, skills and abilities relevant to the organization, survey participants were asked to select from a list all the competencies (one or more) in which their organization is interested in the three-year perspective.

A total of 2,059 representatives of physical culture and sports organizations from various regions of the Russian Federation, in the positions of managers or human resources staff, took part in the survey. This survey was part of a comprehensive monitoring study on the demand for specialists in the field of physical culture and sports, conducted by SPbSRIFPC since 2019. [2]. The research procedure was carried out using special software and a web service developed by SPbSRIFPC for the collection, processing and analysis of questionnaire data.

Results of the study and discussion. Based on the distribution of respondents' answers, groups of competencies were identified that the survey participants noted as the most in demand (more than 30% of mentions). According to the survey, the most significant group of competencies for specialists in physical culture and sports organizations was 'Organization and conduct of physical culture and sports events', with 58.7% noting this group as in demand in the next three years. Similar levels of demand (around 30% of mentions) were noted in the competency groups 'Legal support for physical culture and sports' (31.3%), 'Digitalization (IT technologies) in sport' (30.9%) and 'Financial and economic planning in physical culture and sport' (30.1%).

Less in-demand competency groups included areas such as 'Professional qualities of a leader' (18.7%), 'Strategic and project management' (13.8%), 'Anti-doping activities' (12.6%), 'PR and marketing in physical culture and sport' (11.4%), 'Management' (10.2%) and 'HR consulting' (4.5%). The survey participants named competencies in the field of international activities in sport (2.6%) as the least in demand in the three-year perspective.

The figure 1 shows the distribution of demand for competencies based on the number of survey participants who marked them as relevant (data in % of the total number of respondents' answers; each respondent could mark one or more competencies).

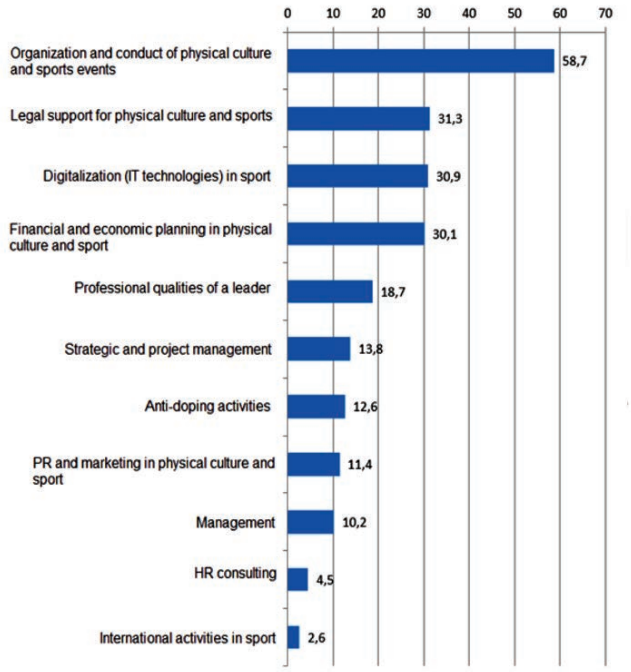

Fig. 1. Demand for various groups of competencies in physical culture and sports organizations (%)

To obtain more detailed data, an analysis of the demand for competencies was conducted within the areas most significant for organizations. Within the most sought-after area, 'Organization and conduct of physical education and sports events,' the most significant competencies were identified as the organization of physical education events, training sessions, camps, and competitions (42.6%), planning the activities of physical education and sports organizations and training athletes (34.3%), and organizing methodological work in the field of physical education and sports (26.3%). Less important, but also significant in this area, were material and technical support (22.6%), the introduction of modern technologies (22.4%), ensuring the safety of events (19.9%) and coordinating the work of coaches (18.9%). The least in demand, according to the survey participants, was the organization of sports selection (12.1%).

Within the area of 'Legal support for physical culture and sport,' the most important areas were legislation in the field of event safety (19.9%), regulation of labor relations (19.9%) and document flow in the field

of physical culture and sport (18.6%). Less popular areas were those related to personal data protection legislation (18.2%), the contract procurement system for state needs (17.1%), and sanitary and epidemiological requirements (12.5%).

Within the area of financial and economic planning, the leading areas are planning, budgeting and financing of organizations' activities (27.6%), financial, accounting and statistical accounting (15.1%), and development of business models using business modelling tools (7.1%).

In assessing competencies within the promising area of digitalization and IT technology in sport, survey participants noted the importance of modern digital technologies for collecting and analyzing competition data (20.9%), digital technologies for collecting data on the condition of athletes (17.6%) and the possibilities of applying artificial intelligence (15.8%). Competencies such as digital means of communication (11.7%) and interaction with state information systems (8.3%) were noted as less important.

Conclusions. Thus, according to the survey data, there is a trend towards high demand for knowledge and skills in areas related to solving current organizational tasks, conducting events, legal regulation and financial planning. The priority is on competencies related to the organization and conduct of physical education and sports events, and the ability to effectively organize both competitive and training processes.

The second most important area is legal support, especially with regard to event safety and labor relations.

Digital technologies and their potential applications for data processing and analysis, improving the effectiveness of competitive activities, and developing new organizational opportunities through the use of digital technologies are also quite significant.

The development of professional competencies in the field of financial management also occupies an important place in the strategic management of sports organizations, primarily issues related to the effective allocation of resources, current financial support, effective budgeting, accounting and statistical accounting.

The areas identified by participants as less in demand – professional qualities of managers, strategic and project management, anti-doping activities, etc. – suggest that the development of these groups of competencies and their importance for organizations increases as a result of the need to solve specific tasks, and may be higher for individual organizations, target groups or areas of activity.

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